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FARMERS DIGEST

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The Farmer's Digest

From more than two hundred magazines and bulletins published in this country and abroad, the Editorial Staff of the Farmer's Digest selects articles of outstanding merit and general interest. It is comprehensive in its scope, covering all phases of Agriculture.

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I

The Farmer's Digest

Vol. 2 February, 1939 No. 10

Show Ring Merry-Go-Round

Condensed from Successful Farming

L. M. Winters

University of Minnesota

LIVESTOCK-JUDGING and show rings are the outgrowth of early British market days. As the owners and attendants were sitting around waiting for buyers, they frequently fell into arguments as to which was the better or best "beaste." Wagers followed, settled by a disinterested party giving judgment. From this humble beginning, shows which included only market animals were eventually organized. Then someone brought forth the idea that if shows were in order for market animals, they should also be in order for breeding animals, since breeding animals were necessary for the production of market animals. Since then there has been a gradual expansion of the livestock show and livestock-judging. It is not far amiss to state that our show rings and our livestock judges have achieved such prominence that they dominate our thinking as regards animal improvement.

There can be no question but that animal-improvement has been made during this period. The breeds have been developed and improved; types have been changed from time to time as changing conditions necessitated changes in types (sometimes oftener); and inferior-type animals have become somewhat less frequent on our markets. But have we gone as far forward as is possible by present methods? Can livestock-judging do everything that is sometimes credited to it? Is the show ring going in a circle like the fairground's merry-go-round, or is it traveling in a straight line to a worthy goal?

Livestock-judging has been extremely useful as a means of pointing out gross differences between animals. It has been useful as a means of classifying animals in groups according to their use-

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fulness for distinct purposes. Difficulty enters in, however, when we attempt to make sharp distinctions between animals within these larger groups. Some may disagree with this statement, but, if it were not true, our placings on the hoof and on the killing rail would be in closer agreement than they are. Because of the difficulty in recognizing what is actually under the hide, the Danes market swine by carcass-grading rather than by live appraisal; and Canadians, after something like a decade of trial, are marketing a large share of their swine subject to railgrading. Judging the market classes of lambs and swine first on foot and then on the rail was introduced in Canadian shows some 10 years ago. It was so highly beneficial that fat cattle have also been included recently.

That our appraisal of animals on the hoof is quite satisfactory so long as we do not make too-fine distinctions is borne out by studies of dairy cattle. A good many years ago, the late professor Haecker divided the Minnesota dairy herd into four groups according to their type. The groups were known as (1) beef, (2) less beef, (3) spare, (4) dairy. The volume of production went up and the cost down with the increase in dairy conformation. Some years later, J. W. Gowen, now of Iowa State College, conducted a more exacting study of the relationship between dairy type and production. In this case only dairy cows were included. As a result of his investigation, Gowen concluded that the reliability of body signs as indicators of probable milk yield was not great. Even a short-time milk record, such as the seven-day test, had a far greater value. He also found that a yearly record more nearly predicted future production than did size or shape of the body parts.

These conclusions point to the fact that so long as we are dealing with gross differences, as was Professor Haecker, we can do a very good job of selecting animals for performance on the basis of type, but when we are forced to finer distinctions we encounter difficulties.

Those of us working mainly with meat animals have prided ourselves on being able to do a better job than the dairyman in selecting animals for performance on the basis of appearance. Even this, however, appears doubtful. J. L. Lush, of Iowa State College, while in Texas, carried out a very thoro study on this point, as a result of which he makes the following statements *(Texas Bulletin Number 471)*:

"Individual gains, dressing percentages, and commercial value of the carcasses of steers at the

end of the fattening period can be predicted with only slight success at the beginning of the feeding period. Even with careful measuring and weighing of the animals as was done in the experiment, the shape and size of the feeder steer indicated only to a slight extent its desirability at the end of the feeding period.

"Confirmation is often the only basis available for judgment and, of course, should be given some consideration at all times. However, the data indicate that no score card or standard based on conformation could ever be so accurate that the future performance of individual steers could be predicted from it with but few mistakes. Form and function in these respects are not closely enough correlated.

"Steers of many shapes will gain well and steers which gain the same may be of many different shapes. The same is true of dressing percent and meat values, altho future dressing percent and future live-meat value are slightly more closely correlated with conformation than future gain is."

For three years the Minnesota Station fed steers individually in order to study differences in economy of gains. While experiment was set up for a somewhat different purpose than that of Lush, the results verified his conclusions. Steers which were of the same market grade at the outset of the experiment showed marked differences in respect to economy of gains. Many visitors passed thru the feeding yard each year. The young man doing the feeding the last year took a special pleasure in asking the more prominent cattle judges to select the most efficient steer on the basis of appearance. One steer was an almost unanimous choice. As it happened, he was the least efficient of the 18 steers on trial! This no doubt is something of an extreme case, but it serves to illustrate the point that none of us can do as good a job picking animals from appearance for performance as we sometimes think we can.

In meat animals it would be a fine thing if, in a few classes at least, we could have the animals judged on the hoof, then in the carcass, and finally have the carcass cutout value determined. This should prove of much interest and also be highly educational. With dairy cattle, since milk-production is the business they are bred for, one class at least might be set aside for cows with five-year production records and which during that time had produced five living calves. The prizes to such a class would be awarded on the basis of their five-year production records. Some of us might even be surprised at the kinds of cows that would win in such a class.

Many admirers of the show ring argue: "But we must not do anything which will sacrifice constitution and type. They must be emphasized and re-emphasized in order that our stock does not deteriorate." Well, what is constitution? Is it measured by width between the forelegs, heart girth, breadth of head, openness of nostril, and size of muzzle? If these are the criteria, why is it that race horses and mules possess such a remarkable amount of stamina? Why is it that medical men watch their human patients of the stocky type unusually closely following operations? Why is it that bacon hogs actually have more lung and heart capacity than typical lard hogs? Why is it that the Texas Longhorn survived under conditions where our modern beef type would quickly pass out of existence? No, strength of constitution cannot be measured that easily; it is something ingrained in the physiological functioning of the body.

In like manner, what is type? Vaughan gives this popular definition: "Type provides the animal with the proper form of structure for the kind of work or production required." But we have already seen that we cannot predict efficiency from type. What is it, then? We have one flock of Shropshire sheep at Minnesota that we are breeding for efficiency. Their performance is satisfactory altho not so high as we would like. Critics have told me we have no type in the flock, and I ask them what they mean by type. They point out that the ears are too long and the faces too dark. My reply is that if the butcher can take a long ear off a Hampshire lamb, it shouldn't be more difficult on a Shropshire. Just why is a short ear so important on a good Shropshire and a long ear important on a good Hampshire? Why is it so essential that the face of a Suffolk be black, a Hampshire dark brown, a Shropshire a shade lighter brown, and a Southdown mouse color? I know the deviations from standard in our flock do not satisfy the show-ring standards, but why that kind of standard? Farmers raising sheep for market like the rams out of this flock. They seem to feel that these rams do more for them.

During the evolution of judging, the idea has grown that a real, keen judge can place animals on the basis of their future performance as breeders. Several years ago I was purchasing some sheep from one of America's outstanding sheepbreeders. During the selection I asked him which one of several rams he considered would prove the best sire. The question was put in such a way as to make him think I believed he possessed that ability. And he

just laughed at me; he told me that he had long ago found out that was one thing that just couldn't be done.

Since we cannot recognize outstanding sires from their appearance, would it not be a fine thing to have a class for proved sires, the prizes to be awarded on the basis of their records as sires? What an interesting class that would make!

One unfortunate result of our modern show standards for breeding animals is the reduced fertility and even sterilization of many of our best young animals.

It is a standard practice to clip show sheep early in order to have a heavy growth by fair time, and heavy conditioning is necessary to win in most shows. The result is that many of our best individuals are forced to go thru the hot months of summer in high condition and with what would normally be a winter's crop of wool. In addition they are subjected to shipping from fair to fair in hot, close cars and similar unfavorable confinement when at the fairs. As a result I have had a surprisingly large number of rams, purchased from the show circuit for breeding purposes, brought to me because they did not settle the ewes. Examination in every instance indicated that they were suffering from a previous heat treatment. I have also observed show bulls and stallions that apparently were suffering from similar past treatments.

I do not believe anyone who is familiar with the development of the livestock industry would question that improvement has been made by the show-ring approach. The problem we are now confronted with was stated aptly by Secretary Wallace in his 1938 Spragg Memorial lecture: "One of the real handicaps in the development of superior strains of meat-producing animals has been the lack of adequate means of measuring performance."

We can now return to some of the questions which were stated in the first part of this article, namely: "Have we gone as far forward as possible by present methods?" "Can livestock-judging do everything that is sometimes credited to it?" Perhaps we can go still farther forward by present methods, but certainly these methods have definite limitations. It has been pointed out that we cannot do all the things in livestock-judging that are often assumed. Our task for the future is, therefore, to retain the most desirable of past methods and to find ways and means of improving on these methods. In part this will be accomplished thru research, but even well-organized research is too slow to keep pace with the rapidly changing world. We should remember that many of our greatest im-

provements have been made in the field itself. Some changes on the basis of known facts should be attempted in the field. Then by pooling those experiences with results taken from research we should be able to approach more rapidly the goal all good stockmen are interested in, namely: making it possible for the commercial producer to put out a superior product at a lower cost. It is only thru adhering to this goal that we will be able to meet the conditions of this dynamic world.

Blood Transfusions for Calves

Condensed from the Ayrshire Digest

DURING the past two years, we have followed the standard practice of injecting newly-born calves with their mother's blood," writes Professor H. P. Davis, of the University of Nebraska. "A total of about 80 cc's is used, and injection is made just as soon as possible after birth. The blood is put into the neck, and not more than 20 cc's are used at any one place, so as to not cause any possibility of congestion."

Professor Davis adds, "We have found from observation that this practice seems to give our calves a start in growth and vigor that they do not usually possess. Of course, this is a matter that is very difficult to measure, for many calves will doubtless get along very satisfactorily without this additional treatment. However, there are certain animals which are somewhat weak at birth, and these are usually so stimulated by this plan as to get started in growth and development without any handicap.

"We have also used mother's blood very usefully in connection with treating pneumonia, and have injected quantities up to 200 cc's into the jugular vein."

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Anti-Freeze Solution for Tractor Tires

Condensed from The Ohio Farmer

WITH the recommendation of tire makers themselves that cheap anti-freeze solution be used in the tires as a means of increasing tractor weight and thus obtaining better performance, it is likely that this method will outstrip all others in popularity.

Formerly more drawbar pull has been obtained by adding iron wheel weights. But this method has several disadvantages in addition to the cost, main objections being that the weight is unbalanced, awkward to handle and causes a drag on the tractor. Liquid-filled tires, on the other hand, do not increase drag, permit perfect balancing and are in no way awkward. Other advantages listed by tire makers include better riding qualities, considerably improved drawbar pull, lower center of gravity and greater general efficiency at all speeds thru 25 miles an hour.

Simple water in the tires will bring about most of this improvement, but in cold weather it is necessary to prevent the liquid from freezing. To find a cheap anti-freeze that was harmless to metal and rubber parts was something of a problem. But farm engineers solved it in the use of commercial calcium chloride. Now the practice is to fill the tires at the outset with a solution of about 80 percent water and 20 percent calcium chloride. This protects solutions for all normal winter cold periods. This solution is heavier than water and since weight is the goal desired, it is superior to water in all general practice. The cost averages 90 cents, naturally being less for small tires and more for very large ones.

To make it easier to fill a tire, a special adapter has been devised, on one end of which is a standard garden hose coupling and on the other a standard tire valve connection. On the adapter is a bleeder valve so that as the air pressure in the tire grows on account of the liquid being forced in, the right amount of imprisoned air can be allowed to escape and so make it possible to continue the rate of flow of the incoming liquid.

If there is no air pressure on the farm, the tire can be filled by gravity flow, or by use of a special bucket spray pump. Such a pump is now on the market. It is made especially for filling tires. Like the adapter mentioned above, this spray pump is fitted with a hose that has on the end a standard tire valve connection.

Reprinted by permission from The Ohio Farmer, Cleveland, Ohio, Dec., 1938

It is recommended that the tire not be filled above the valve level when the valve is in the top position. With no load on the tire, filling it to this point takes about three-fourths of the inside space. Calcium chloride should be added to water, never the other way around.

The general procedure for filling up the tire is as follows:

1. Jack up tractor and turn the wheel so as to place the inner tube valve in the top position.

2. Remove the valve core to bleed air from the tire, attaching the hose adapter immediately to the valve so that it will not be pulled back into the valve hole as the air is released.

3. Attach hose to adapter.

4. Fill tire with water or calcium chloride anti-freeze solution to the desired level.

5. When tire is filled to the desired level, remove adapter from valve and replace valve core securely in valve stem.

6. Inflate the tire with air to the proper pressure and remove the jack.

Productivity

Plowing down soy beans, cowpeas, or vetch when the plants are in the bloom stages is said to improve soil productivity three times as much as plowing down rye, wheat, or buckwheat after sixty days of growth.—*The Furrow*

Balanced Plant Nutrition for Healthy Crops

Condensed from California Cultivator

R. E. Stephenson

A HEALTHY, well nourished, vigorously growing plant is strongly fortified against disease. Inadequately nourished plants on the other hand are as susceptible as the poorly nourished human or animal body. A truck grower who fertilizes lavishly stated that he had little trouble from either disease or insects. "My crops grow too fast," he said. "Insects make no impression."

But quick growth alone is not insurance against disease. There must be "balanced" nutrition. Excessive nitrogen without sufficient minerals may stimulate a rapid but tender, susceptible type of growth. The abundance of nitrogen must be balanced with phosphorus, potash, lime, magnesium and other minerals of lesser abundance but of no less importance to normal plant development.

It is reported from the Rothamstead Experiment Station in England that excessive nitrogen caused wheat and barley to suffer severely from rust and mildew. Tomatoes likewise become more susceptible to disease from excessive nitrogen. Potash had a marked effect in increasing disease resistance. Phosphorus likewise had a favorable effect. This was on soils deficient in phosphorus and potash. Liberal use of nitrogen, therefore, resulted in unbalanced nutrition. In contrast, on soils rich in phosphorus and fair in potash, a fairly liberal rate of 350 pounds an acre of sulphate of ammonia to supply nitrogen increased disease resistance with potatoes.

It is apparent therefore that the type of fertilizer which will produce the best balance in the nutrition of the plant, and greatest resistance to disease, depends upon what the particular crop is able to take from the soil. One soil may supply an excessive amount of available phosphorus, and the crop may need a liberal use of nitrogen to produce a balance. In general the more liberally fertilizer is used the more attention should be paid to balance, not in the fertilizer but in the nutrition of the crop. When very heavy applications are made to the average soil it is safer to use a high grade complete fertilizer, so far as balanced nutrition and freedom from crop disease are concerned.

Plants differ both in their

Reprinted by permission from California Cultivator, Los Angeles, Cal., Nov. 5, 1938

needs and in their ability to obtain nutrients from the same soil. The crop factor, therefore, can never be overlooked in considering nutritional balance. The important fact is that disease is closely associated with plant metabolism. Parasitic disease develops when the metabolism or growth processes of the host plant become unbalanced. In selecting a fertilizer, therefore, it becomes highly important to consider fertilizer ratios as well as grades. A very high grade complete fertilizer may fail to supply the best ratio or balance for a particular crop. What is best for one crop may not be best for another, and what gives highly satisfactory results on one soil may fail entirely on another.

This situation leads to the very important problem of diagnosis of soil and crop needs. Considerable progress has been made in diagnosing soil deficiencies. Lime deficiency or acidity and lack of nitrogen in the available nitrate form, or lack of available phosphorus in the soil is comparatively easily diagnosed. There is not yet a simple method for detecting low availability of potash.

But the problem of balanced nutrition cannot be solved until there are simple methods of detecting what is occurring within the growing plant. The Germans are reputed farthest advanced in this type of diagnosis. It has been learned that deficiencies within the plant may be best detected by examination of the young leaves and growing tips and buds. Some of the German scientists who are sticklers for detail, have become quite adept both in interpreting leaf appearances and in the application of simple chemical tests to leaf sap. Plant diagnosis has passed through alternate stages of good and bad repute, but undoubtedly better understanding of plant metabolism will lead to more accurate diagnosis of crop needs.

Any discussion of the diagnosis of the plant and soil is very likely to end with the conclusion that the problem is intricate beyond any practical solution. Every farm and field, and even different parts of the same field, and each crop grown upon a field becomes a specific problem. On the other hand never has progress along this line been so rapid as in the last few years. The plant physiologist and pathologist, and the soil scientist and chemist and even the economist have combined forces to solve the very practical problem of producing bigger yields and higher quality of product at the least cost.

As agriculture becomes more highly specialized fertilizers must be more liberally used. Their use involves expense, which must return a profit. No individual farmer has much to say about prices

except as he produces a larger acre yield of higher quality which will naturally command the highest market price. Freedom from disease affects both quality and the yield of marketable crops. Fertilizing for yield and for disease resistance becomes therefore a very important profit factor.

Very great soil deficiencies are comparatively easily detected, and when recognized are easily corrected. A disease of tobacco in Connecticut known as "sand drown" was identified as a severe case of magnesium deficiency. The trouble was corrected by the use of potash salts carrying magnesium. In Florida, malnutrition of crops was identified with magnesium and copper deficiencies in the soils. A light application of fifty pounds an acre of manganese and copper salts corrected the trouble.

There are, however, many cases of poor nutrition, and lack of vigor of growth where the trouble is not easily detected. Orchards poorly nourished fail to make proper growth, are of low vitality and unfruitful. The cumulative effect of malnutrition is insidious and sure. Trees are so slow growing and undemonstrative in immediate response to treatment, that low vitality and susceptibility to disease develop more or less unobserved. A prominent orchard specialist in Pennsylvania reports that he finds the orchard cover crop so much more quickly responsive than the trees, that cover crop response is the safest guide to fertilizer practice. This is especially true in fertilizing orchards because the cover crop becomes the source of humus which means much to the vitality of trees. This same investigator states that ten years of careful work has demonstrated that the future returns from an orchard may be correctly predicted from the vigor and growth of the present cover crops.

Examples are so abundant that health and vigor result only when crops are well nourished, and that yields and profits are measured accordingly. Fertilizers must be used to supplement the normal supply of nutrients in the soil. Most soils supply some of everything needed but availability is not sufficiently rapid for strong, healthy, plant development. Fertilizers must be used in sufficient amount and with sufficient frequency to afford a constant and regular stimulus to vigorous nutrition. Crops once stunted grow out of it slowly, if ever. Balanced and complete nutrition means health, vigor, large yields and high quality, which are major factors in profitable agriculture.

Sea Island Cotton

Condensed from Farm Journal

J. Francis Cooper

CRYING lustily for its former place in the sun—and likely to get it, too—is Sea Island cotton, once an important crop in the agriculture of 20 central-Florida counties and an almost equal number in Georgia and in South Carolina. In other words, the crop is staging a comeback.

Census figures show that from 1900 to 1917 the United States crop of Sea Island cotton, all of which was grown in the three southeastern states, ranged between a low of 57,500 bales in 1906 and a high of 119,293 in 1911, and averaged 91,051 bales which brought an annual income averaging around two or three million dollars to growers in each of the three states.

But by 1918 the No. 1 enemy of short staple cotton (the boll weevil), which was an even worse enemy of Sea Island, was making itself felt in the three states. Production dropped to 52,208 bales that year, to 6,916 in 1919 and to 1,868 in 1920. It staged a slight upswing in 1921 and climbed to 5,125 bales in 1922, only to fall back to 785 in 1923 and to the insignificant figure of 11 bales the following year. The entire crop comprised only around 20 bales each year through 1931, when planting ceased.

To understand this decline and fall, remember that Sea Island cotton grows tall and late. The stalks must set and mature bolls almost to the tops for the crop to be profitable. A situation like this is made to order for the boll weevil, which is especially destructive to late squares.

Short staple cotton can be planted thickly in the row, and each stalk will have opportunity to set a crop of low bolls before the weevil population, reduced by winter hibernation, has time to build up for heavy summer attacks. Not so with Sea Island—it makes a rank growth and the plants can not be crowded. Consequently the boll weevil was able to deal what appeared to be a death blow to this industry.

Consternation reigned among growers, ginners and others connected with the industry. Spinners sought other staples, such as Pima and Egyptian, and researchers developed methods of substituting short staple for long, particularly in tire manufacturing. Factory and plantation of one of the biggest thread-making

Reprinted by permission from the Farm Journal, Philadelphia, Pa., Dec., 1938

organizations at Madison, Florida, became idle, the machinery dilapidated.

Things looked so unpromising that the United States Department of Agriculture, which maintained pure-seed plots of Sea Island cotton on the islands off the coast of South Carolina, where this strain could not possibly be contaminated by crossing with short staple, decided to discontinue its plots with the end of 1934.

In the meantime, however, a few growers in Gilchrist county, Florida, early in 1934, decided to see if they could again grow their once-favorite crop. No cotton, either short or long, had been grown in the neighborhood in several years and the boll weevil had been starved. Their efforts were crowned with success, and 16 bales were produced that year.

Encouraged by this initial effort, they increased their planting the following year. Their crop went to 170 bales. Hearts of old Sea Island growers were flaming again, their beloved industry that they had thought dead was showing signs of rejuvenation. The fever spread to other counties of the old belt, and in 1936 Florida growers turned out a total of 800 bales. The neighboring state of Georgia added a few additional bales. The Department of Agriculture planted ten acres on the Carolina Islands in 1937 and again in 1938, since production had again reached sizable figures.

A long step on the comeback trail was taken in 1937, when Florida farmers produced 3,200 bales of the long staple, and Georgia 800. Average production was around 100 pounds (one-fourth bale) of lint per acre. This year Florida's 14,800 acres will produce, maybe, 1,500 bales; and Georgia's 11,900 acres about 1,000 bales. The boll weevil got in some pretty good licks this year and cut the yield.

To aid the industry in its process of rejuvenation Uncle Sam assigned two men to work with farmers from offices in the Florida Experiment Station in Gainesville. In 1938 it assigned three others there for boll weevil control experiments. Experiments are being carried on at Tifton (Georgia) Experiment Station. The Florida Station agreed to grow seed in isolated plots, and to conduct tests and otherwise aid the growers.

The 1937 Florida Legislature, at the behest of Dean Wilmon Newell, of the College of Agriculture, passed an act enabling freeholders of counties or even smaller political subdivisions to vote in Sea Island cotton control, which would prohibit the production of any other staple within the limits of the political unit. To date four counties— Gilchrist,

Marion, Bradford and Union—have voted to exclude all cotton except Sea Island.

Florida's agronomist W. E. Stokes says four things are essential to continuance of the re-established industry. These are pure seed, boll weevil control, proper culture and fertilization, and careful ginning to preserve the long staple.

To maintain seed purity, he recommends roguing out off-type plants before they bloom, growing Sea Island at least a mile from upland cotton, and ginning Sea Island in gins which handle only this crop.

Something New in Cowdom

E. V. Willey

JUST outside of Stillwater, Oklahoma, where the A. and M. College is located, is what is believed to be the only herd of midget cattle in existence.

Otto Gray, owner of the seven midget cows and bull, has traveled many miles to secure additions to his herd; he has spent much time and money during the last two years in breeding, feeding and getting tests on milk production.

Today, farmer Gray is convinced that this cow, weighing about 400 pounds, and standing about 36 inches high, requires half the feed and pasture of an ordinary animal, but will outdo a normal good milk producer. A cow often produces as much as 5 gallons a day.

The first midget was an Angus, found near Claremore, Oklahoma. This animal was bred to a normal bull, and her offspring was bred to a normal Hereford bull, both resulting in midgets. The event waited for now is the result of the breeding of the midget bull to one of the midget cows not in direct line. Gray seems certain the line will be perpetuated, as these animals are not freaks, but midgets by nature.

—*Farm and Ranch*

Cashing Pasture and Forage

Condensed from The Shorthorn World

A. D. Weber

Kansas State College

FORAGES yield a cash return only when fed to livestock. There is no cash market for many of these crops and most of them are so bulky that it is not profitable to transport them to distant markets. Even roughages that are moved from farm to market eventually are consumed by livestock. As a consequence of their physical characteristics, forages must not only be marketed through livestock but in general must be fed on the farms where they are produced.

The profitable utilization of pasture, forage, and grain together with problems relating to efficient crop production are the concern of livestock farmers. Manifestly, their job is much more complex than that of farmers who specialize in the production of cash grain. It is a job that requires close attention twelve months in the year. Success comes with intelligent study and conscientious effort on the part of the individual farmer.

There are a few major factors responsible for consistently satisfactory cash returns from pasture and forage crops over a period of years. As I have already indicated the human factor is perhaps the most important of all. Another factor is the supply of forage. Not infrequently farmers are forced to reduce or even to suspend livestock operations entirely when feed crops are short or a total failure because of drouth. That happened in 1934 and again in 1936 with the result that in many instances there was forced liquidation at low prices. And now when prices are good there is an abundance of feed but nothing to feed it to.

It is not always advisable or even possible to step up livestock production in line with the maximum production of roughages in extremely favorable crop years. Nor is it always economically sound to reduce livestock production to the barest minimum level in years when crop production is greatly restricted because of severe drouth. Of course, some response to changes in available feed supplies frequently is a sound business practice. Yet experiences in recent years prove

Reprinted by permission from The Shorthorn World, Aurora, Ill., Nov. 25, 1938

that maximum cash returns from forages are obtained in this region only when livestock production is stabilized. This can be done by the judicious use in lean crop years of reserve feed supplies carried over from years of abundant production.

Silage will keep indefinitely if made properly. And in semi-arid sections, bundle feed will keep several years even when stacked in the open. Proof for this may be found in the experiences of a Thomas County Kansas farmer. He was not a livestock grower but did believe in diversified farming, hence raised row crops as well as wheat. He never destroyed any cane hay or bundle feed but always stacked it carefully and sold it whenever opportunity arose. Some of this feed kept perfectly five or six years. The most interesting thing about his experiences, however, is that he always sold all his surplus feed at good prices in dry years. And in 25 years his good judgment had resulted in the accumulation of a sizeable fortune. Most of his wealth resulted directly from the sales of roughages to livestock men who had failed to provide a reserve feed supply for their herds. In the light of this and similar experiences it would seem that at least a portion of forages produced in 1938 might well be stored for use at some future time when feed is scarce.

A third major factor that influences net cash returns from forages is the efficiency with which these crops are produced. Success depends as much upon being a good crops farmer as it does upon being a capable livestock breeder or feeder. The two are inseparable. And it is tremendously important that a proper balance be maintained between crop enterprises and livestock enterprises.

A fourth major factor relates to financing the livestock enterprise. In the past it was frequently impossible for a farmer to engage in the type of livestock production best adapted to his farm because lending agencies did not appreciate the fact that a long-time livestock program and hence long-time credit arrangements are often necessary to obtain maximum cash returns from pasture and forages. Agencies financing livestock operations have a powerful influence upon the livestock production of a community. It is to be hoped that these agencies will study different systems of livestock production and help to adapt these systems to the needs of individual borrowers. Both the borrower and lender need to do a lot of intelligent studying before a loan is made.

A closely related problem concerns the relations between landlord and tenant. Longer tenure

through equitable stock share leases offers the best way out, and there is some indication that this type of livestock farming is increasing and in my opinion landlord-tenant relations with respect to livestock farming will determine pretty largely the success of agriculture in a given region.

The fifth major factor determining maximum cash returns from forages is the selection of a system of production best adapted to an individual farm. One might as well try to put a square peg in a round hole as to try to get maximum returns from forages by keeping a cow herd on a farm having no pasture. Yet this system is an excellent one when both roughages and pasture are available.

The relationships between amounts of roughage, grass, and grain produced on a farm are important things to consider when selecting a system. Another important thing to remember is that no system will yield maximum returns if it does not produce the kind of product that the market wants or is willing to pay a good price for. Thus preference should be given to young cattle over older cattle because consumers want small cuts of meat. And fortunately for the farmer, young animals make much more economical gains than older animals.

Sheep and cattle fit in better than hogs with systems of livestock production that necessitate the use of relatively large amounts of roughage. However, hogs have a place on many farms particularly where alfalfa and grain are available. The fact that hogs make good use of grain often results in maximum returns from a forage crop like Atlas Sorgo. When Atlas Sorgo is topped, the butts make excellent roughage for beef cows. The heads are an excellent fattening feed and are utilized to good advantage by hogs.

The production of feeder pigs is another possibility on those farms where good summer pasture like sudan grass or alfalfa is available. Of course, hogs do not consume a lot of roughage but they oftentimes make an important contribution to a well-balanced farm program and from that standpoint are worthy of consideration.

From the standpoint of getting a cash return from forages sheep offer greater possibilities than hogs but possibly not as great as cattle. A farm flock is a decided asset on many farms and subsists to a considerable extent on roughages that might otherwise be wasted. Fattening western lambs on ground sorghum roughage, a protein supplement, some ground limestone, and a minimum amount of grain offers ex-

cellent possibilities for profit in the sorghum belt.

A cow herd properly handled is the safest beef making proposition available to farmers in Kansas and Nebraska. Good type cows produce best results. Depth and width of body insure good gains. The cows should also be close-made, that is compactly built. This type of cow raises early maturing, thick-fleshed calves that are easily fattened. Then the cows should be smooth, which means attractive feeder calves that fatten evenly and bring top prices when fat.

The cow herd must be wintered well if maximum cash returns are obtained from the pasture and forage they eat. Wintering the cows well is necessary for strong calves, a high percentage calf crop and uniformity of calf crop.

It is rather difficult to estimate the exact amount of feed that should be provided for cows in the breeding herd. On most farms the cows run in stalk fields, wheat fields and meadows and have access to straw stacks and low-grade hay, each of which contributes materially toward a maintenance ration. If silage is the only roughage available we can safely estimate that each cow will consume in the neighborhood of one ton per month. This is more than need be fed, however. And, of course, if straw and other low-grade unsalable feeds are available, the amount of silage fed to each cow often may be cut to 800 to 1000 pounds per month.

It is important that a close estimate be made of the protein feeds needed by the cow herd. Too often protein supplements are supplied in inadequate amounts or overlooked entirely. Alfalfa hay is an excellent source of protein and will meet a cow's requirement for this nutrient provided four or more pounds are fed daily. If no alfalfa hay is available, one pound of cottonseed cake or its equivalent should be provided per cow per day. Cows thin in flesh and those receiving an inadequate supply of good quality roughage in severe weather often should be fed as much as two or even three pounds of cottonseed cake per head daily.

In estimating the feed requirements of beef cattle it is often helpful to remember that one pound of cottonseed cake will replace four pounds of alfalfa hay. Also, that each pound of alfalfa hay is equivalent to about three pounds of silage in so far as the appetites of beef cattle are concerned. For example, each pound of alfalfa fed to cattle that are being full-fed on silage will reduce the silage consumption about three pounds.

Early calves also increase the cash returns from forages. This is true irrespective of whether or

not the calves are creep-fed, but it is especially true when the calves are allowed free access to grain in creeps where the cows cannot enter. Calves learn to eat grain quicker in a feed yard than on pasture. Cows that drop early calves maintain a good flow of milk longer than cows that calve late in the spring. The reason, of course, is that grass boosts the milk flow and as a result the early calf gets a longer suckle. Then, too, the early calf is on grain when the grass begins to fail in July.

Creep-feeding January and February calves makes it possible to hit a high market in October and November. Calves handled in this manner will gain about two pounds per head daily. Thus a creep-fed calf weighs about 700 pounds when 10 to 11 months old. The heifers and steers sell together. They are fat and of the weight the packer likes.

In addition to the roughage and pasture eaten by its dam, each creep-fed calf provides on the average a market for from 25 to 30 bushels of grain, 300 pounds of hay, and 100 pounds of protein supplement. There is perhaps no method that will produce as much beef from so little grain or that makes use of such large amounts of unmarketable roughage to as good advantage as the production of creep-fed calves.

Like a cow-herd, a deferred system of full feeding is especially well adapted to farms where roughage, grass and grain are available. This system produces finished cattle on less grain than is required when cattle are full fed during the winter months.

With the deferred system, choice steer calves may be wintered well on an average daily ration of 4.5 pounds corn or other grain, 1 pound cottonseed meal, and 25 pounds silage. They make an average total winter gain of 250 pounds and the total feed consumed during this time amounts to only 10 bushels of corn, 150 pounds of cottonseed meal, and 1 3/5 tons of silage. Only good pasture is required for the 90-day period between May 1 and August 1, during which time the average gain per steer is approximately 100 pounds.

Steers handled by the deferred method should be full-fed 100 days in a dry lot beginning August 1. During this time the average total gain per steer is about 250 pounds, and the total feeds consumed are as follows: ground shelled corn, 26 bushels; cottonseed meal, 100 pounds; and alfalfa hay, one-fourth ton.

The deferred system of full-feeding may be summarized by saying that a choice steer calf gains approximately 600 pounds in eleven months. His total feed bill includes 36 bushels of corn,

250 pounds of cottonseed cake, 1 3/5 tons of silage, ¼ ton of alfalfa hay and 90 days grazing. The deferred system is often said to produce "more gains from less grain." Certainly, it is an excellent way to obtain a cash return from forages.

Steers that are wintered preparatory to being grazed a full season the following summer should not, as a general rule, be fed grain during the winter months. A steer calf will eat about 30 pounds of silage a day and needs one pound of cottonseed cake or its equivalent as a source of protein. In other words, each steer calf on a wintering ration will require approximately one-half ton of silage and 30 pounds of cottonseed cake per head per month. He should gain at least one pound daily. Yearling steers on a wintering ration need about 1500 pounds of silage and 30 pounds of cottonseed cake per month.

Wintering steer calves or light yearlings well and selling them in the spring as fleshy feeders is an excellent system to use where roughages are plentiful and grain and grass are not available. With this system just enough grain and protein supplement should be fed with a full feed of roughage to insure a winter gain of about 200 pounds per steer. Such a large gain would not be desirable if the steers were to be grazed, but since they are intended to go to the corn belt for finishing this extra gain is really an asset.

Any of the systems I have described is safe and will produce excellent results when used on the kind of farm to which it is best adapted. Just what cash return may be expected from each ton of roughage fed during the coming year is impossible to say. It seems safe to predict, however, that if a farmer will select the system or systems of livestock production especially adapted to his farm, and does his part to see to it that the feeding and management are handled properly, the cash return for home-grown feeds will be satisfactory in 1939.

Sources of Poisoning

Condensed from New England Homestead

K. Palmer

EVERY year numbers of domestic animals are lost mysteriously. Horses, cows, pigs, dogs, chicks and cats sicken or suddenly die, and the veterinarian or pathologist cannot find any disease or other apparent cause of the trouble. Chemical tests may show the presence of poisons and suggest the probable cause of illness or death.

In most of the cases where poison is found, the cause is due to accident or carelessness on the part of the owners. The price paid for carelessness ranges from a few to hundreds of dollars.

Poisonous Plants

In the first place, owners of animals should be able to identify the poisonous weeds. Deadly nightshade, hellebore, sheep laurel, water hemlock, or the dried foliage of chokecherry and wild cherry have rung the death knell for many a grazing animal.

Ordinarily animals will not bother with poisonous plants. It is only after a dry season, or in early spring, when forage is scarce, or after a cow has been tethered and then permitted to wander freely, that she is tempted by the luscious green of the weeds. In one case a cow was found dead within ten feet of the handsome nightshade whose deadly tops she had chewed off.

When chokecherry is killed with a spray of sodium chlorate, as is recommended in some instances, the dried material forms a salt on the withering foliage, and it is well known that salt attracts cattle. The wilted leaves contain hydrocyanic acid, a sufficient amount of which is sure death to animals.

Lead Poison and Spray Residue

Arsenic and lead poisoning lead all others in the causes of death, the records show. Sometimes a farmer forgets that paint may contain lead. He leaves an old can in the pasture or gives his fences and barn a neat white coat and neglects to keep cows and calves away until the paint is thoroughly dry. Result: animals die of lead poison. They have licked the fresh or flaky paint from the wood.

In one instance a farmer was so bent on cleanliness about his premises that he painted the inside of his silo. The fermenting ensilage dissolved the paint ingredients contaminating the en-

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silage with lead, but this discovery was not made until after the loss of several animals.

Spray residue is not an infrequent cause of poisoning. Wind blowing when trees are being sprayed with lead arsenate may carry some of the material to meadow or pasture grasses nearby. Drippings from the sprayed trees are also a source of trouble. If hay is made before a heavy rain has a chance to wash the residue from the grass, it may contain poison. Lawns treated for the Japanese beetle may be a hazard to the dog that has buried his bone in the soil.

Not long ago several valuable heifers died for no apparent reason. They had been pastured in a field where nothing of a deadly nature could be found, yet arsenate was in the stomachs of these animals. Looking for a clue, Mr. Shepard noticed that the turf from the next field had been plowed up and that the calves had dragged some sods through the woven wire fence. Inquiry revealed that vegetables had been grown in the field the previous year, and that they had been sprayed with an arsenical mixture. The heifers had eaten some of the grass and had played with the sods, tossing them about so that the soil was scattered over their pasturage.

A less frequent cause of death is cyanide, and an unsuspected source is in the pits of cherries and peaches. During a wine-making process on one farm, someone had pulverized cherry pits which were later thrown into the garbage, a tasty dinner for the pigs. Shortly afterward a number of the little pigs died and others in the litter were ill. Examination of their vitals revealed cyanide.

A recent field day exhibit of the Agricultural Experiment Station, at New Haven, Conn., called attention to some of the sources of accidental poisoning. All persons should know that animals need a plentiful supply of clean water. Too much salt, especially without sufficient water, has been fatal to chicks. Rat poison should be placed where only rats will find it. Ant bait can be kept safe from children and animals by inserting it in a small piece of rubber hose or placing it in a tin box with holes in the bottom. Poisonous weeds should be destroyed, and branches of chokecherry or wild cherry with wilted foliage should be removed from pastures.

The Brown Swiss Breed of Cattle

Condensed from The Southern Planter

NO breed of dairy cattle has enjoyed greater progress and popularity during the past fifteen years than the Brown Swiss. When it is considered that the first Brown Swiss were imported into this country only a little over a half a century ago, the amazing growth of this breed is quite startling; particularly, when one realizes that all of the Swiss cattle in the United States today are the result of less than 140 females. Today, Brown Swiss grace the dairy farms of all states where this type of farming progresses; they are growing year by year in numbers and are becoming an increasingly important factor with dairymen who are concentrating their efforts on the production of milk which contains four per cent butterfat. Brown Swiss are the world's largest producers of four per cent milk.

The origin of this breed is of a romantic nature. Brown Swiss first roamed the steppes and valleys of western Asia, many centuries ago, and were introduced into central Europe about the time the Huns over-ran Europe and sacked Rome. To Switzerland, however, goes credit as being the first permanent home of the breed. Here these cattle began taking on the characteristics which mark them today. And it was fortunate that the breed found its home here. Switzerland is world famous as a dairy center. The Swiss are expert dairymen and breeders. It is from this little Alpine country that continental dairymen import the stock to strengthen the quality and productiveness of their herds.

It is an established fact that Swiss cattle, reared and grazed on the Alpine grass, are among the healthiest and sturdiest of breeds. Swiss cattle, because of their mountain habitation, are forced to "work for their living." This, in a large part, explains their ruggedness and the trait is very noticeable in all Brown Swiss in America at the present time.

A New Englander, Henry M. Clark, of Belmont, Massachusetts, imported the first Brown Swiss into America in 1869, the importation including seven heifers and one bull. Various importations followed this until an embargo was placed upon all European cattle. Then came a period of several years during which time no Brown Swiss were added to American herds. In 1931 several animals were imported. The embargo was of course respon-

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sible for hindering the breed's progress in America in so far as numbers is concerned. It possibly has proved an advantage, however, in that there is no surplus of Swiss cattle in this country today, nor has there been throughout the depression. Furthermore, American breeders have been forced to develop what Swiss were available without the addition of imported stock. The results are apparent: American-bred Brown Swiss are becoming increasingly refined from a dairy type standpoint, and their production is steadily going higher.

Brown Swiss are considered by many dairymen to be the most beautiful of all breeds. Their color is solid, the males being a dark seal color, several shades lighter along the spine and on the ears and muzzle; the females run from light brown to dark steel gray, with lighter muzzles and ears. Swiss cattle are small-boned for their size and possess a fine silky coat and rich elastic skin. The eyes are full and mild but bright. The barrel of the body is large and well-rounded; the udder and teats well-formed and white, with milk veins prominent. The animals in a herd are even in appearance, showing careful breeding extended through many generations. The cows are docile and easily managed. An average herd of cows in milking condition will average from 1,300 to 1,400 pounds in weight. They tend to take on fat readily when dry and give it off slowly in milk. Bulls weigh from 1,800 to 2,500 pounds.

Outstanding features of the Brown Swiss breed and points which make them favorites among dairymen are as follows:

1. Cows possess large, square udders. Teats are good sized, rarely knobby or warty and exceptionally free from disease. Malformation of udder or teats is unusual.

2. Cows give large quantities of four per cent milk—milk containing four per cent butterfat. Eighty-nine per cent of all Swiss to be placed on official test have produced milk testing between 3.5 and 4.5 per cent fat. Only three per cent of tested cows averaged below 3.5 per cent. This is a vital factor in these days when the national trend is toward a four per cent milk. Swiss bulls are being purchased constantly for breeding purposes on other breeds in order to raise the butterfat test.

3. Hardiness and longevity. Swiss cows live longer and give a longer period of profitable production. Two Swiss cows, Believe and Swiss Valley Girl 10th, are the only two cows in the world (all breeds included) to produce over 1,000 pounds of butterfat in a year when over 12 years of age.

4. Only ordinary care is required to achieve success with Brown Swiss. They are easy feeders and easy keepers. This quality has earned for Swiss the name of "the farmer's cow."

5. Calves. Swiss calves average from 80 to 100 pounds at birth; often a calf will weigh 125 pounds. The calves grow rapidly, usually gaining from 80 to 100 pounds per month. This feature means a great deal to farmers who depend upon a certain amount of income from the sale of veal calves.

Brown Swiss present a strong appeal to the dairyman who desires large production of four per cent milk, cows which require minimum care, live long and produce strong, healthy calves; cows which are docile and easy to handle. The breed is thriving in all dairy sections of the United States and is one of the few types of cattle which can thrive with profit in sections where conditions are adverse to dairying.

Trim Your Bull's Feet

Condensed from American Agriculturist

E. S. Harrison

TESTING and herd analysis have brought breeders face to face with the fact that only a small percentage of the bulls used prove to be superior sires. A bull is at least five years old before it is possible to complete a test on a sufficient number of his daughters definitely to prove his value as a sire. Half the dairy bulls are dead by the time their actual value is known. Obviously, it is highly important to have a bull available for future service if the tests on his first daughters establish him as a superior sire.

There are many reasons responsible for the short useful life of the dairy bull. One of the most common, however, is the complete neglect of the feet on many bulls. It is not uncommon to find a bull housed in a small box stall with no chance for exercise. Under these conditions there is nothing to wear the toes off and the bull's feet soon look as though they were equipped with skis. As the toe grows out, it is elevated, which in turn greatly increases the strain on the hock and pastern, and eventually is responsible for a leg breakdown.

For years there has been a saying among horsemen, "no feet—no horse." Many dairymen would do well to take stock in this saying and apply it to the dairy bull. Nothing will limit the

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usefulness of a bull quicker than neglected feet and brokendown legs.

Proper care of a bull's feet does not present a serious problem.

The first step is to fasten a strong rope around the horns. Then carry the rope back over the top of the neck and pass it around the body, just back of the forelegs. Hold the rope tight from head to the point just back of the shoulders. Now, pass the end of the rope under it and draw it tightly around the body. The rope is then carried back over the top line to a point just in front of the hips and again passed around the body and adjusted in the same manner. Now pull on the rope, which will cause it to draw tightly on the muscles that control the hind legs. The legs become useless, and the bull will go down easily.

With a large, strong bull it is necessary to have two men in the ring to prevent the bull from moving forward as the rope tightens. It is also advisable to have two men draw on the rope so as to tighten it quickly and prevent the bull from struggling.

A second rope is fastened around a hind leg. This rope is then carried over the top of the body and passed under the neck. It is then drawn until the leg is brought up close to the body and then tied.

If the bull fights and struggles in an effort to regain his feet, the head can be held back. This will take the fight out of him, and he is not likely to offer further resistance.

In the actual trimming of the foot, the toe is first cut back until the foot takes on a rounding form. If the foot has been neglected for a long time, it will probably not be possible to accomplish this at the time of the first trimming without danger of drawing blood. When a pink color shows, it is a danger signal, and the toe should not be further shortened.

The toe thickens when allowed to grow out, which elevates it and tends to throw the weight back on the heel of the foot. Simply shortening the toes does very little to correct this condition. It is necessary to pare the sole of the foot to let the toe down. Care must be used to leave the surface level so the animal will stand squarely on the foot.

If the front feet only need attention, it is seldom necessary to lay the bull down. The front feet can be trimmed with the bull standing. A plank may be placed under the foot and the toe shortened with the use of a chisel and hammer. The leg may then be placed on a simple stool and the sole pared. With a young bull or a gentle bull, it is frequently possible to trim the hind feet in the same way.

How "Thick Whites" Get That Way

Condensed from The Poultry Item

Sylvia Hawthorne

A HEN'S ability to lay eggs with thick albumen, valued by producers and consumers alike, can be inherited, according to experiments recently completed at the National Agricultural Research Center, at Beltsville, Maryland.

The experiments, which were conducted over a period of seven years, showed that a hen's ability to lay eggs containing a high percentage of thick white was an inherited tendency and that neither the number of eggs produced nor the weight of the eggs had any significant effect upon the percentage of thick albumen in freshly-laid eggs. A logical conclusion, says Dr. C. W. Knox, of the Agriculture Department's research staff, is that producers may build up flocks which will produce the best eggs by breeding from hens that lay many large eggs containing high percentages of thick white.

Eggs with a large quantity of thick white are rated high by producers because the thick white keeps the yolk near the center in candling, while consumers prefer the thick white because it means better eggs for poaching and frying. In storage, the thin white tends to become thinner, so the more thick white to begin with, the easier it is to preserve the eggs' quality.

Dr. Knox and his associates found that the average fresh egg contains from 50 to 52 per cent thick white. They bred two flocks of hens. One flock produced eggs having an average thick white percentage of 68 per cent while the other flock produced eggs with an average of 45 per cent. The percentage of thick white is continuing to increase in the first flock but the second flock apparently has reached its peak.

The best method of handling eggs when collecting and storing them to avoid damaging the thick white, closely resembles the method used by dairymen in handling fresh milk. Speed and care are essential, especially speed, because the greatest depreciation occurs *almost immediately after the eggs are laid.* They should be collected as soon after laying as possible, preferably in a wire basket which permits them to start cooling immediately. Then they should be stored in a cool place such as a cellar or a cave built for the purpose. These precautions will preserve the

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thick white and make the eggs command a higher price on the market.

All of the eggs from a flock of 27 Rhode Island Red pullets were broken from the time of their first egg, October 1, 1932 to November 1, 1933, a 56-week period. In all, 2,928 eggs were broken. This test was not applied to eggs laid Saturday afternoons, Sundays or holidays. Data was assembled for the individual pullets laying the eggs and records were carefully kept of total egg production, the egg's weight, weight of the total albumen, weight of thick albumen, and the percentage of thick albumen. The eggs always were examined within a few hours after they were laid.

The variation of the percentage of thick albumen among eggs from different hens was much greater than from the same hen. This apparently demonstrates, says Dr. Knox, that the difference is due to the individual hen rather than to feeding conditions, temperature, or care.

A steady decrease in the amount of thick albumen occurs from October and November down to the lowest point in June when it starts to rise again. This is not due to temperature apparently, for Beltsville is cooler in June than in July or August. Nor is it due to egg production or egg weight, as these reach their peak earlier in the season.

The same method of experimentation was used with a flock of 14 yearlings and other Rhode Island Reds in 1933 and 1934, while a group of 20 yearlings were used from 1934 to 1935. It was found that practically the same trend was followed by the hens as that followed by the pullets except that the hens showed a higher percentage of thick white. This makes it apparent that the decrease in percentage of thick albumen was not due to age, but that age might be one reason why hens' eggs contain a higher percentage of thick white.

There are whispering reports among poultrymen that the addition of several percent of irradiated yeast to poultry feed produces a greater percentage of thick white. There are reports, too, which claim that feeding rye to hens tends to increase thin white. Neither of these reports has been proven, according to Beltsville specialists.

According to Dr. Knox, there is no definite indication that there is any relation between feed and the production of eggs containing a high percentage of thick white. A shortage of feed will eventually stop production of eggs but the small eggs laid before production stops entirely contain as high a percentage of thick white as normal feeding produces.

Bio-dynamic Farming

Fred Heckles

THE Bio-dynamic method of Farming and Gardening is one of the contributions of the late Dr. Rudolf Steiner, of Dornach, Switzerland. It is in use on more than two thousand farms in various parts of the world. More than fifty thousand acres of land are worked bio-dynamically and have been, with great success, for a period of ten to fourteen years. The method having become more generally known in this country only recently, the total of such farms here is still small. There are, however, a number of good bio-dynamic farms, most of them in the east, open to the inspection of anyone seriously interested in investigating this matter in terms of techniques and practical results.

The bio-dynamic farmer and gardener work entirely with organic fertilizer materials, animal manures and plant compost. Both varieties of refuse material are rotted down to humus before they are applied to fields or gardens. A simple technique of composting for both, including careful piling for the conservation of moisture and the organic content, produces in comparatively brief time substances rich in neutral colloidal humus.

The effectiveness of the techniques and the essential value of certain plant drugs added to the manure and compost have been conclusively proven. The tests have taken the form of controlled experimentation under scientifically exact conditions. And, what is of even more practical importance to the working farmer and gardener, they have taken the form of five-year comparisons on larger farms where complete and accurate records of costs and income and quantity of yield have been kept. In such cases, it has been possible to get a real picture in terms of five-year periods, without the Bio-dynamic method and with the Bio-dynamic method.

While the careful handling and treatment of manure and compost are the first essential, these farms and many other farms and gardens have followed a further series of practical procedures. The effectiveness of the treated organic fertilizers was enhanced by the use of two "fertilizer sprays." At the same time equal stress was laid upon carrying through soil-conserving crop successions. Such crop successions are carefully worked out for the particular place in question in co-operation with one of the Bio-

dynamic information centers. In outlining these, due weight is given, not only to soil-building and maintenance, which call for the periodic use of legumes in the succession, but the given factors of soil, climate, terrain, and market conditions are equally stressed.

Along with certain biological measures for the care and treatment of fruit trees, the foregoing shows in general outline what constitutes Bio-dynamic farming and gardening in terms of its fundamentals. Needless to say, careful tillage practices, such as the avoidance of plowing or harrowing when the ground is too wet, and similar careless usages, are of absolute importance where any organic fertilizing methods are practiced.

There are further Bio-dynamic measures, having to do, for example, with improving the health and long-term yield of the cattle, getting the most out of the farm woodland, and so on. The nature of the treatment of the farm and garden can be realized when it is understood that the Bio-dynamic method aims at developing the farm, and to a certain extent the smaller gardening establishment, in terms of a self-contained, organic biological unit.

A full treatment of the Bio-dynamic method in terms of theory, techniques and practical results, is available in the book, "Bio-dynamic Farming and Gardening," by Ehrenfried Pfeiffer.

A consensus of opinion of those using the Bio-dynamic method shows that they continue with it for a variety of reasons. They find that they are able to produce crops equal in volume yield to those raised by other methods and almost always superior in flavor and keeping quality and hence superior in terms of cash return per unit of volume. At the same time, Bio-dynamic farmers and gardeners report very noticeable improvement in the health of plants and animals and resistance of plants to extremes of drought and of moisture. It is also very generally observed that bio-dynamically treated soils show a cumulative improvement in structure and in their ability to retain humus. It must be emphasized that such good results are always directly correlated with the skill and capacity of the particular farmer or gardener in question. Undoubtedly this relationship is more noticeable here than where more artificial ways of working are practiced.

In conclusion, it should be emphatically stated that the Bio-dynamic method is not "opposed to chemical fertilizing." It has simply been found on the basis of practical experience and soil analysis that it is possible to work successfully without any lacks or shortages of the needed chemical

elements in the soil. As long as this continues to be so, it is consireded preferable for two reasons to do without the addition of fertilizer salts. The effect of such salts on the organic life of the soil, the earthworms and soil bacteria, is too well known to need comment. Also, out of a full appreciation of the necessity of a balanced chemical solution in the soil, arises a further hesitation to add various highly soluble salts. It is common knowledge to the chemist in the laboratory that the addition of a highly soluble salt to a solution will cause the precipitation of heavier elements already present. A similar result is probable in the soil solution as a result of the addition of quantities of highly soluble salts. Elements such as manganese, the aluminates and zeolites, which have recently been found to be essential to plant growth, would then not be in an available form.

Further information regarding the Bio-dynamic Method of Farming may be obtained from Anthroposophic Press, 144 W. 57th St., New York City

Heredity and Environment

Condensed from American Poultry Journal

F. B. Hutt

Cornell University

THAT popular old subjecct for debate, "Which is the more important, environment or heredity?" has long since been discarded by the geneticist, who recognizes that these two important influences are mutually interdependent and that both operate to produce the inherited character. This is quite obvious to the poultryman in some cases, particularly in such an inherited trait as egg production. The importance of heredity in determining the number of eggs that a bird will lay is not questioned, but, at the same time, every experienced poultryman knows how badly the production can be affected by such adverse environmental conditions as faulty feeding, extremely low temperatures, and disease.

It is in the cases where the influence of environment is less conspicuous that the poultryman may be inclined to attribute a certain condition entirely to heredity, or vice versa, where the influence of environment is very conspicuous, he may be tempted to overlook entirely this fact that there is also a genetic basis for the condition or behavior thus affected. It is the purpose of the present article to point out several examples of how heredity and environment interact to produce the thing which the poultryman sees.

Most people probably do not think of environment except in terms of feed, weather, housing conditions, and external influences of that sort. The expression of a hereditary character really depends very largely upon the internal environment in which the genes affecting that character operate. (A gene is a minute unit of inheritance.) The hormones, or secretions of the endocrine glands, play a very important role in determining how an inherited condition may be expressed. Dr. C. H. Danforth, of Stanford University has shown in an extremely interesting series of experiments the extent to which the color and structure of plumage may depend upon genes and upon hormones.

He found that when skin from a Barred Rock female is grafted

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at an early age to the back of a Rhode Island Red male, the feathers which later grow upon it are barred, as in the donor, but have the long lacy structure found in other saddle feathers of the male host. Conversely, if a graft from a Barred Rock male be put on the back of a Rhode Island Red female, the feathers are again barred like those of the donor, but have the rounded structure characteristic of normal females. Obviously, the color and the barring are decided by the genetic nature of the feather follicles in the graft. The structure of the feather, however, depends upon the kind of sex hormone to which the feather is exposed during its development, and that, in turn, depends upon whether the sex hormone comes from an ovary or from a testis.

Another good example of hormonal modification of an inherited character is found in fowls stimulated to early egg production by artificial light. The age at sexual maturity is inherited, although it varies somewhat depending upon whether the birds are hatched early or late. On exposure to artificial light during the short days of November, late-hatched pullets, which otherwise would not begin production till January, can be brought into the laying stage. In this case we have two environmental influences affecting the genetic capacity. One is the light; the other is a chain of hormone actions resulting from stimulation of the bird's hypophysis (or pituary gland) by artificial light. (The hypophysis of the fowl is a gland about the size of a kernel of wheat which lies in a small cavity in the base of the skull.) The anterior lobe of this gland produces a hormone which activates the ovary, or, in other words, induces sexual maturity at an age somewhat earlier than would be possible without the exposure to artificial light.

Another internal influence, which can be considered as a type of environmental modification of an inherited character, is that resulting from the effect of other genes. Some inherited characters, although resulting chiefly from a double dose of a single gene, will vary considerably in their appearance depending upon other genes which the bird carries. For example, embryos carrying a double dose of the lethal "creeper" gene usually die at about 3 or 4 days of incubation, but Dr. Landauer, who studied this condition, found that in outcrosses of one strain of Creepers to an entirely unrelated strain of Creepers, a number of these "homozygous" embryos, that is, embryos having a gene for this character from both parents, lived through 21 days of incubation.

Their survival was attributed to the hybrid vigor resulting from a particularly favorable combination of genes following the cross. The creeper condition is a character, which, so far as has been shown, is little affected, if at all, by external environment. It is clear, however, that the internal genetic environment is influential in determining whether the embryo shall die at an early stage or can live to hatching time. Somewhat similarly, in the small fruit fly, Drosophila, which is the favorite material of the geneticist, a certain type of abnormal abdomen is a simple recessive character, but in some lines the number of those showing abnormal abdomens is as low as 25% when all of the flies have the genetic constitution which should produce that condition. Other lines show varying proportions of flies affected. In this case the manifestation of the character depends not only upon the particular genes responsible, but also upon all the other genes which differentiate the strains.

That modification of a fowl's egg production can result from adverse weather conditions is well recognized and does not need discussion here. At the California Experiment Station, Doctors Hinshaw and Asmundson have recently shown an interesting relationship between heredity and environment in the turkey. The peculiar condition in which the crop accumulates an enormous amount of fluid and hangs down below the breast is hereditary.

When birds subject to this condition were raised about two miles from the ocean, where the maximum temperature was about 74° F., with high humidity and some foggy weather, none of them developed pendulous crops. However, when full brothers and sisters of these birds were raised in a place where the mean maximum temperature was higher by about 20°F., with more hours of sunshine and lower humidity during the growing period, 67% of them developed the peculiar condition. Here is a case where one might think the environment was entirely responsible, if it were not that a series of genetic experiments indicated clearly that the condition is hereditary.

Another interesting case of the external environment's effect upon an inherited character is found in the change of egg size during extremely hot weather. In a series of experiments at the Kansas Experiment Station, it was shown that the size of egg drops sharply when the temperature gets above 85° F. The decrease in size varies from 15 to 20%. There is no doubt that egg size depends upon the genetic constitution of the hen laying the egg, but it is also very susceptible

to the influence of the environment.

A good example of a condition which is so subject both to genetic modification and to the effects of environment that arguments about its cause have been carried on for years, is provided by the common defect called "crooked keel" or crooked breastbone." Experiments by Prof. Platt, at the new Jersey Experiment Station, showed that chicks allowed to roost at 3 weeks developed crooked keels, while those not provided with roosts up to 8 weeks of age did not develop crooked keels. He also showed that the width of the roost is a factor, since those given roosts only one inch wide develop much more curvature of the keel than those having three-inch roosts.

Similar experiments elsewhere have confirmed these findings. By themselves these facts might support the claims of those who have maintained that crooked keels result entirly from early roosting. However, Dr. Warren, at the Kansas Experiment Station, found that after selection for several years he could differentiate two strains, in one of which 88% of the males developed crooked keels, while in the other only 3% were so affected. Quite obviously there is a genetic basis for the condition, and the contention of many poultrymen that the birds with crooked keels should not be used in the breeding pens is therefore justified.

But who can say whether environment or heredity is the more important factor? In this case the important thing is that both of them exert an important influence and should be considered by the poultryman who wishes to avoid loss from crooked keels.

Environment Shows up Hereditary Differences

Sometimes hereditary differences are revealed only when the environmental conditions are suitable for showing them up. During the summer of 1936, the poultry flocks at Cornell University experienced a more prolonged session of extremely high temperature than had been experienced during the preceding 10 years. There were sufficient numbers of R. I. Reds and White Leghorns on hand to show conclusively that the White Leghorns are much more resistant to extremely high temperatures than are the R. I. Reds. This distinct breed difference, however, could never have been shown (except by experimental methods) if there had not been the requisite environment provided by that one week of extremely high temperature.

Studies made by Dr. Stefan Kopec in Poland showed that there is a seasonal variation in the color of egg shells. This ap-

plied both in Buff Orpingtons and in White Leghorns. The reason for such a fluctuation is not clear, but it is obvious that the darker shade occurred during the winter months, with the lightest colors being found during the summer. Whether or not the temperature is a factor remains to be shown.

It is clear, however, that anyone attempting to eliminate from his flock any birds which tend to lay off-color eggs, would not get the same results if he practiced his selection in mid-winter as if he did it in mid-summer. Color of egg shells unquestionably depends upon inheritance, and yet, as Dr. Kopec has shown, it varies greatly with the season. Although the actual basis for this variation is not known, presumably an environmental modification of some sort is responsible.

Burbank of Pecandom —

Condensed from Farm and Ranch

Jane Jester

MR. RISIEN, who is a native of England, came to San Saba county, Texas, sixty years ago, and for the past fifty years he has devoted his time, money, and knowledge to the pecan industry—an industry that is still wearing swaddling clothes. For his outstanding work, and truly he has done more for the pecan than any other man, he was awarded a medal by the Texas Pecan Growers Association in 1937. The Forty-Second Legislature also honored him for his contributions to the pecan industry and the many scientific discoveries he has made in the culture of the nuts.

It was quite by accident that Mr. Risien became interested in pecans. A half century ago he had no idea that he would be one of the earlier pioneers in this new field. But fate decreed that he would be one of the biggest men in one of the biggest industries in Texas.

Sixty years ago the demand for pecans was practically nil. Farmers hauled wagon loads of these nuts into town and if there were buyers they sold at prices so low that it seems almost unbelievable. But if there were no buyers present they returned home with their pecans and usually threw them into the hog pen.

San Saba was then (and still is) one of the greatest pecan markets in the State. It was here that Mr. Risien out of idle curios-

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ity began to compare the various types of pecans. One day while thus engaged he found a nut with a very thin shell and excellent flavor but rather small in size. Nothing he had seen, tasted or heard of could equal it. Upon inquiry he found that the nut came from a tree located on the San Saba river near where that stream joins the Colorado.

By this time his interest was aroused and he determined to buy the land on which that tree stood. He did buy it, but alas, his troubles were not ended. With the exception of one tiny twig, the tree was barren of limbs. They had been sawed off so that the pecans might be gathered more easily. A weaker man than E. E. Risien would have been discouraged, but not he. Instead, it aroused his fighting spirit and made him go to work with renewed energy. He named the one twig tree the San Saba, and it became the mother tree for dozens of varieties of pecans. They include the San Saba Improved, Texas Prolific, Liberty Bond, Squirrels' Delight, Commonwealth, Improved Kincaid, Number 60, and Western Schley.

With the purchase of this tree, Mr. Risien's scientific experiments began. Miles upon miles he rode, searching for a tree that he thought would be good enough to cross with his mother tree, San Saba. At last, after looking at thousands of trees, he found what he desired and carefully took off the pecan catkins (male blossoms), placed them in his saddle bags and carried them home where the pollen from them was placed on the pistillates (female blossoms) of the San Saba. Thus cross pollination was achieved.

At first paper bags were used to cover and protect the newly mated blossoms but high winds and rains deemed this unwise. Next he tried using capsules which proved to be the very thing. The largest size capsule completely covers the blossoms and provides ideal protection. A small piece of cotton saturated with pollen is placed inside the capsule, then when the capsule is placed over the pecan flower and fastened to the stem by means of a small wire, enough pollen falls from the cotton to fertilize the pistil. On damp nights these capsules expand, allowing the nut to grow and at the same time protecting it from the case borer—a dreaded enemy of the pecan.

Mr. Risien has not wasted his time on a nut whose only use is that of a garnish, for the pecan is the most versatile of all foods. It can be used effectively in every dish from cocktail to dessert. Nothing else equals it in food value.

Following are the results of a recent Government pecan analy-

sis: 18 per cent carbohydrates, 17 per cent protein, and 70 per cent fat. Of the fat 77.8 per cent of it is linolic acid which has the same value as linseed oil. The pecan then contains 54.5 per cent of approved food value. In addition to this, the nuts are rich in vitamins A and B, and probably others that have not been discovered yet. Nut fats are the easiest of all fats to digest and it is one of the best sources from which to draw proteins.

Mr. Risien has done just as much for the past of the pecan as he has for its present and future. He proved that Texas was undoubtedly the cradle of the pecan by finding a petrified whole pecan. He found the fossil embedded in a rock strata 80,000,000 years old. Several years ago Ross R. Wolfe, well known fossil collector and horticulturist of Stephenville, found two pecan impressions and one pecan still encased in its outer green hull in a San Saba hill formation estimated to have been 200,000 years old. These pecans were about the size of the present-day paper-shell.

In every country where pecans are grown, Mr. Risien's books are discussed, his practices followed, and his advice listened to eagerly. Trees of his breeding culture are grown all over United States and in many parts of Europe, Africa, and Australia.

The Influence of the Hatching Date

Condensed from The Michigan Farmer

K. T. Wright

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ONE of the important problems of the poultryman is when to hatch or buy the baby chicks, since that decision has considerable influence on the subsequent management and returns. About one-fifth of a group of farmers keeping records with the Michigan State College farm management department from 1931-1935 obtained the chicks in March, 55 per cent in April and one-fourth in May. The average hatching date of the chicks on all the farms was April 16.

During the period of this study, the men getting their baby chicks in March paid about 9½ cents apiece for them, compared with 8¼ cents in April and slightly over 6½ cents in May. Both expenses and death loss on

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the early hatched chicks were higher than on April and May chicks. The income from broilers averaged 15 dollars per hundred baby chicks on the March chicks, about 13½ dollars on April chicks and 10¼ dollars on May hatched chicks. The net cost of a 24-weeks-old pullet on these farms, after deducting all income other than pullets from the expenses was 63 cents for those hatched in March, 59 cents for those in April and 49 cents for those hatched in May. Thus, there was a difference of 14 cents in the net cost of March and May hatched pullets during the period 1931-35.

Getting the baby chicks hatched in May, however, in order to produce the pullets at the lowest cost may not be the most desirable plan from the standpoint of obtaining the maximum profit from the poultry enterprise. The records of the March hatched pullets as "layers" the following year (October to October) were compared with those of the April and May hatched pullets. The March and May hatched pullet flocks both laid approximately 165 eggs per birds as an average, while the April pullets laid 177 eggs. There was, however, considerable difference in the monthly production. The October and November production of the March and April pullets was about the same, with the May pullets having about one-third lower average daily production. During the next three months some of the March hatched flocks experienced molts lowering the average production below that of the April hatched pullets, while the May hatched flocks "picked-up" on their earlier hatched sisters, and had a higher per cent production in March than any. This seasonal variation in production influenced the average price obtained for eggs due to the fact that egg prices averaged more than 50 per cent higher in October, November and December than during the other nine months. Thus, the average yearly price received per dozen eggs was 20.4 cents for March hatched pullets, 21.3 cents for April, and 18.4 cents for May.

The mortality of the March pullets was slightly higher than those hatched later, and they likewise consumed more feed, making the cost per dozen eggs higher. Thus, when it was all "summed up" with all expenses included and the pullets charged into the laying flock at their actual cost of production, there was a net return of 63 cents per bird in March-hatched pullet flocks, 92 cents for those hatched in April and 50 cents for those hatched in May. Thus, the net return was greatly affected by the date that the baby chicks were hatched.

Taking the Bull Visiting

Condensed from Guernsey Breeders Journal

Ivan H. Loughary

Extension Dairy Husbandman, Idaho

TAKING the bull to visit other herds is a plan recently adopted by owners of small herds in Idaho. A carefully supervised bull stud is being substituted for the long tried bull associations. Several Studs are in their first year of operation and seem to eliminate some of the disadvantages of bull associations.

The Idaho bull stud plan provides for the delivery of a stud bull for service to the cow owner's farm, by truck or trailer. This arrangement greatly appeals to the cow owner in that it relieves him of the inconvenience of attempting to lead, or lead into a trailer a cow that is not broken or accustomed to such handling. Limited experience with stud bulls has shown that they are handled more easily than the average cow, and that the cow owner prefers delivered bull service to the inconvenience and time required in transporting the cow.

Under the bull stud plan, one stud bull operator can handle six or more bulls, which provides him a full-time occupation. More efficient management practices may be expected in operating a bull stud than in operating an association block bull.

A much greater area can be more efficiently serviced with fewer bulls than is the case in bull associations. The average number of cows per block in bull associations in the United States is thirty-five. The Idaho bull studs have seventy-five to 125 cows per bull, or approximately 3.5 times as many cows as are now being served by association bulls.

The benefits that may be expected from the successful operation of bull studs may multiply by several times those of the average bull association. The cooperative breeding societies of Denmark and Holland have demonstrated that many more cows can be served by one bull than is the practice in the United States. The bull studs of the Island of Guernsey and of the Island of Jersey record 200 to 400 services per bull per year.

The Idaho bull stud plan, in so far as is known, is the first at-

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tempt on the part of the State Extension Service to meet the breeding problems of the small herd owner, excepting by organized dairy bull associations which have failed to accomplish their purpose when organized among small herds. Idaho has not adopted bull stud organization as a proved extension project but rather as a trial demonstration.

Observation reveals that most owners of two to eight cow herds have little interest in a standard breeding program, and less appreciation of the need and value of superior inheritance in their dairy cattle. Many such herd owners have been securing bull service from their neighbors to whom they seldom pay a service fee. The service payment is made by promise rather than in fact. Consequently, bull service usually is obtained from a different neighbor each year or season. This practice quite commonly involves a change of breed each year. It is rather uncommon to find a well-bred pure bred sire in use in communities where small herds are the rule.

Stud service has been quite satisfactory in the case of horses for many years and farmers do not seem reluctant to pay this service fee. However, where bull service is involved the same farmer objects to a fee of four to five dollars.

No effort has been made to make the Idaho bull plan service purely co-operative, excepting in spirit. The cow owners have no investment, and only agree to use the stud bull. In the average stud there are from twenty-five to thirty cow owners to each bull. The investment per bull in the studs is about $300, and a maintenance fund should be sufficient to replace the bulls each two years. Collection of the stud fee, which is usually three to four dollars, is somewhat of a problem because of the low income and lack of ready cash among the small herd owners.

Disease spread is one of the fears manifested by the use of a stud bull on so many herds. It is a well-known fact that the small herd owner is the least diligent in maintaining disease-control programs. Because of this factor rigid rules must be followed to assure the minimum chance of disease spread. All agreements require that a prophylactic be administered the bull, and that the feet of the bull and the trailer be disinfected before leaving the premises of the farmer whose cows are being serviced.

The management of the bull stud must be efficient and thorough to assure satisfactory results. A monthly meeting of the committee or board, composed of the County Extension Agent, bull

stud owner, and one or more persons representing the cow owners, is held to check results and adjust complaints.

This bull stud plan of supplying high-quality bull service to the small herd owner seems to offer the best solution to an unsolved problem that affects the greatest number of herds and cows of the nation.

Don't Burn the Leaves

A. J. Pratt

EVERY year thousands of dollars literally go up in smoke because leaves are burned. Next summer, gardens will "burn up" for lack of water. Leaves are valuable, for when decayed they form humus, and humus in the garden helps keep the moisture in the ground and thus helps to prevent dry weather injury. Humus also helps the soil in many other ways.

Save the leaves this year and help build the garden soil. They can easily be made into humus. Rake the leaves when they are wet, pile them in an obscure corner of the garden, and let them decay. If raked while they are dry, put water on the leaves as they are piled. Have the pile broad and flat-topped. A year may be required for the leaves to decay properly.

To hurry this decaying process, this suggestion is helpful: To twenty pounds of dry leaves, or to forty pounds of very wet leaves, add one pound of a mixture of five pounds of ammonium sulfate, four pounds of ground limestone, and two pounds of superphosphate.

Another mixture may be used, if preferred. Use one pound of the following ingredients mixed together: four pounds of cyanamid and two pounds of superphosphate.

Do not mix either preparation until it is ready for use.

—*New England Homestead*

Profitable Pruning

Condensed from American Fruit Grower

Wm. H. Zipf

NO phase of modern fruit culture is based more on age-old experiences than pruning. From earliest times proper pruning of bearing fruit trees has been a cherished art to the horticulturist. A glance backward into history reveals that the early plant workers based their pruning procedure on the trial and error basis. They knew, for instance, that heavy pruning of a young tree kept it from bearing early and resulted in a general dwarfing of the entire tree. Through their keen observation, some of our fundamental pruning facts were established many years ago. Since then research workers have shown that heavy pruning of young stock ultimately results in dwarfing of the root system, fatal to good tree growth.

Not to be omitted, when the improvement of pruning through the years is considered, are the many advancements made in pruning equipment. Through the use of better pruning tools, the modern orchardist is enabled to take care of many more trees than was possible with the crude hand shears or knives and tree-tearing, cumbersome saws used by early horticulturists. Today, fruit growers and their orchard workers have available efficient, easy-to-operate pruning tools which vary in size from the latest-type "anvil" principle hand shear to the long-pole pruners that allow for easy reaching, from the ground, to the hard-to-get tree spots.

Essential features in the design of today's pruning tools, besides durability of mechanical parts and cutting edges, are ease of operation, applicable both to the smallest hand shear and the large forestry type of lopping shears, and freedom from injury to tree parts. The latter feature, although seemingly unimportant, is really an essential, since jagged pruning wounds are often the entryways for troublesome insects and diseases.

Outstanding features of the saws now being manufactured especially for pruning are improved blade shapes and scientifically designed cutting teeth which minimize operating power needs and injury to bark. So specialized have become the tools for fruit pruning that there is now available a bramble pruner used for removal of canes. This

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new device resembles a set of shears at the end of a walking stick with the operating handle at the top.

On the subject of pruning non-bearing tree fruits, specialists are in accord in their recommendation for light pruning. Numerous experiments have definitely proved that heavy cutting back and thinning out of non-bearing trees results in dwarfing and, in turn, curtailment of fruit bearing in later stages of growth. Trees that have been pruned heavily each year have smaller trunks and main branches, make less total top and root growth, the number of fruit spurs or shoots is fewer, and, at least for the first few years, bear smaller crops. The dwarfing action caused by heavy pruning of young stock results principally from the lack of food-manufacturing leaf area and the consequent lessening of root growth.

For young bearing trees, too, the light pruning principle is applicable. Even though lightly pruned trees may appear top-heavy while bearing the first few crops, they will usually develop more rapidly and produce more fruit if lightly pruned. A general practice is to increase the amount of pruning after the trees have borne two or three commercial crops. To be remembered in pruning young non-bearing and bearing trees is the need for a strong central framework of branches to produce a rugged tree during the full bearing period.

For apples, the principle pruning methods are modified leader, central leader, and open-head systems. The modified leader type of tree training is by far the most popular. Under this system, one limb, usually the center or top branch, after three or four years' growth, is headed to an outward branch. Thus a leader four or five feet in length remains in each tree, and more and better spaced limbs growing at wide angles to the tree from the main framework. There are, of course, modifications of this training used in various localities.

Like apples, it is usually recommended that pears be pruned lighty while they are in the non-bearing and young bearing stages. Pears are usually trained by the pyramidal, open, modified leader, or natural forms. Especially with some varieties like Bartlett and Anjou, the set of fruit is often greatly increased by resorting to heavier pruning after the trees have come into commercial bearing. Another practice of importance in pear pruning is the removal of fruit spurs and water sprouts on the lower parts of limbs near the trunk, to prevent the entrance of pear blight at these points.

In the case of peaches, new

stock is usually headed back to "whips" 18 to 22 inches high. Following the second year's growth, three or four strong laterals are selected from each of the main limbs left from the year before to continue the framework of the tree. More recently, peach growers have followed another system of pruning at planting time. By this method the trees are headed 36 to 40 inches high and side branches are headed back to stubs, each with one bud. Shoots developing from these buds serve as the framework branches.

Fundamentally, the pruning of bearing peach trees consists of moderate thinning out of branches, and those which are to continue as the main framework are headed back to outward growing branches. Center of the trees is kept reasonably open so fruit will color well and to keep growth of new shoots on the main branches. Gradual rebuilding of peach trees can be done by heading back more severely for one year and cutting out higher limbs which usually grow toward the center of the tree. Tops of the main framework branches can be headed back into two-year wood, which will leave the side branches and laterals to bear the crop. Although fruit production may be reduced somewhat for one year, this procedure will cause new growth lower down on the tree, particularly on the inside of the main branches, so that new limbs can be gradually developed and the tree lowered without loss of crop.

Fruit growers in many areas prune cherry trees sparsely. These growers have found that the cherry requires less pruning than any other tree fruit. Since most of the crop in the case of sweet cherry is borne laterally on spurs, the tree branches vary little as the tree grows older and it is therefore unnecessary to do any great amount of thinning to admit light and air. To invigorate old spurs, induce new spur development, and cause additional branching, it may de desirable to cut back upper limbs to outward growing branches as the tree grows older. For sour cherries the modified leader system of training is usually desirable and bearing trees respond well to moderately heavy pruning.

Young plum trees should be pruned lightly. The Japanese type usually requires heavier pruning than the other types for proper shaping of the trees and good growth of shoots upon which new spurs and fruit are formed the season following pruning operations. Because Japanese plums bear such heavy crops while young, older bearing trees soon need a heavier type of pruning to stimulate new shoot growth, to produce fruit of good

quality and size, and to keep the spurs in a healthy condition. European plums should be thinned out by removing small branches and heading back the main limbs lightly to outward growing branches.

The fruit bearing habit and thus the pruning essentials for the apricot are similar to those for the Japanese plum. Generally, the quince tree is trained to a low, spreading head. Centers are kept open and main limbs are headed back during the first few years. To obtain better and larger crops of quinces, it is desirable to head back old trees to laterals for stimulation of annual new growth.

Rapidly gaining in prominence during the past few years is the "thin wood" method of tree pruning which has been used on apples more than any other fruit. This type of pruning incorporates the principle of the removal of small, straggly branches on the inside and lower portions of the tree. It is based on the fact that such wood bears only small, worthless fruit but at the same time is a drain on the tree's food resources.

Sizable apple and other tree fruit prunings, and especially the wood derived from the removal of filler trees, have some market value for use in tool handles, certain toys, and chess men. The U. S. Forestry Service, Washington, D. C., has made available a list of manufacturers who use this type of wood.

A variety of training systems is now used for grapes. Most popular are the Kniffen and fan systems. In the first method branches of the vine are placed along two trellis wires, one branch in each direction from the main cane which extends to the top trellis wire. The first trellis wire should be 30 to 36 inches from the ground and the top wire two feet above this wire. The general rule is to leave 40 buds on each vine, usually with the upper arms carrying two buds each more than the lower arm. It must be remembered that short renewal arms or spurs must be left at the junction of each fruiting arm with the trunk, for from these spurs new canes will develop to bear the following year's crop.

The fan system consists of fruiting arms emanating in a fan-shaped pattern from the top of the trunk which terminates at the lower trellis wire. Canes run from the lower wire to the top wire in a fan-shaped manner. In all grape pruning the number of buds left will be determined largely by the vigor of the vine.

Because brambles produce canes which complete their growth the first summer, bear crops the next year, and then die, it is apparent that canes must be

removed from plantings after they have fruited or the bramble rows will become choked with dead canes. For all brambles, therefore, it is necessary to remove the old canes after harvest. In the case of red raspberries grown under the hill system, five to seven vigorous canes should be left per plant, with the weaker canes being thinned out just before growth starts in the spring. Under the hedge row system, about 10 canes are left to every four feet of row. The canes remaining after the spring thinning-out work should be headed back.

New shoots of black raspberries are usually pinched or cut off when they have reached the height of 18 to 24 inches, but because they have more vigorous growth purple raspberries are headed from 30 to 36 inches high. Lateral branches of black and purple raspberries must also be headed back, leaving them from 12 to 15 inches in length. Pruning of blackberries is similar to that of black and purple raspberries, while Boysenberry, Nectarberry, and Youngberry pruning usually follows the system for red raspberries. Where trellises or other supports are used for the brambles, the height of heading back and pinching are usually governed by performance of the plant in the rows or hills.

Probably the most severe type of fruit pruning is that employed for dewberries. After this crop is harvested, the old and new canes are mowed as close to the ground as possible. When dry, the canes are burned right in the field which practice destroys many insects and diseases. After thorough cultivation new canes make a solid row for the following year's crops.

A caution to be heeded in all bramble pruning is the removal and burning of old canes to lessen chances of mosaic disease and borers and other insect pests infesting the new growth.

Pruning authorities maintain that the most common error in citrus pruning is the cutting off of too many inside or close-in fruiting branches and leaving long, naked areas on permanent frame limbs. As with other tree fruits, citrus trees are trained to definite branch patterns. These include the simple leader type, leader and lateral type, and, more recently, a modified leader type of training has come into practice. The pruning of bearing citrus trees concerns the thinning of dense walls and the exchanging of old side branches for new, as well as the removal of large surplus timber limbs which are located mainly inside the tree.

Insecticide Progress

Condensed from Texas Farming and Citriculture

C. C. McDonnell

U. S. Food and Drug Administration

FOR many years lead arsenate has been used more extensively than any other arsenical for orchard pests. For the past ten years the amount used annually has averaged about 30,000,000 pounds. As a result of study of methods for the control of the boll weevil, calcium arsenate was developed about 1920 and was found to be the most effective insecticide for use on cotton. Its use increased rapidly, and at the present time the annual consumption approximates that of lead arsenate. The only other arsenical compound that is used extensively as an insecticide is white arsenic. Owing to its caustic qualities it cannot be used on foliage, but it is used in large quantities in poisoned baits for the killing of grasshoppers and in the form of an alkaline solution for the dipping of cattle to eradicate cattle ticks. Two to three thousand tons are used annually for these purposes. It is thus seen that arsenical preparations for the control of insects are used in excess of one-half of a pound every year for each man, woman, and child in the United States. This large quantity, much of which is applied to our fruits and vegetables, is causing much concern, and rightly so, to our food chemists, health authorities, and the general public. In addition to the arsenicals, the other poisons of various kinds used on our crops and animals and in our homes amount to many millions of pounds annually.

At present inorganic materials dominate the market, but owing to the health hazard involved from presence of toxic residues on sprayed fruits and vegetables and the restrictions being placed upon the marketing of these products by food control and public health officials, the insecticide industry is undergoing a marked change. Extensive research work is being done by the Federal and State Governments and other agencies to develop insecticides that will minimize this health problem. The substitution of synthetic organic compounds offers the most promise. Some

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progress has been made in this field, but its possibilities are limitless.

The most recent development in the field of new products is the use of rotenone-bearing plant material and extractives, which are highly toxic to many forms of insect life attacking plants and animals and those occurring in the home. Rotenone is a constituent of many plants of the Leguminosae family and at present the principal commercial sources are Derris elliptica (usually referred to merely as "derris") and Lonchocarpus nicou (known commercially as "cube"), which are imported from the British and Dutch East Indies and the northern parts of South America. It has been known for many years that the roots of these plants contain ingredients highly toxic to insects and some other forms of animal life, but it is only during the past five years that their commercial use for insect control has reached large proportions. There are now scores of commercial insecticides on the market that owe their activity to these materials or extracts made from them. This country now imports annually several million pounds of derris and cube in the form of underground and powdered roots.

Another plant material that is used extensively for insecticidal purposes is pyrethrum or insect powder, which consists of the powdered flower heads of certain species of chrysanthemum. While the toxicity of pyrethrum to insects was known more than one hundred years ago, its use as an insecticide has increased tremendously in recent years. We now import approximately 13,000,000 pounds annually, the greater part of which comes from Japan. Experiments are being carried on by the United States Department of Agriculture and some of the State Experiment Stations to determine whether or not it can be grown profitably in this country.

The war against the insects has become a world-wide movement. People are beginning to realize that an adequate supply of food, both vegetable and animal, would be impossible without the use of insecticides and fungicides. In this fight our Federal Government employs hundreds of scientists and trained men, who are devoting their lives to this work, and numerous field laboratories are maintained throughout the country. Every state has its corps of expert workers and investigators. Some of our large cities maintain city entomologists, and California has its county entomologists. Practically all of our agricultural colleges and universities, as well as the medical schools, are training men in insect biology; a number of our large manufacturers and

oil companies, as well as endowed non-profit institutions, maintain research laboratories manned by trained experts, where extensive research on methods of control of insects and the development of new insecticides are being conducted.

Turkey Incubation Goes Commercial

Condensed from Turkey World

J. Holmes Martin
University of Kentucky

DURING the past four or five years, tremendous strides have been made in the hatching of turkey eggs in mammoth incubators. Research work by many experiment stations and the incubator manufacturers has shown that it is possible to get as good or better hatches with turkey eggs in the large incubators as under hens.

There is no doubt that faulty incubation causes physical handicaps which may last for several days and later cause mortality.

Hatcherymen who hope to increase the sale of their poults and the custom hatching of turkey eggs should spare no efforts to learn the most successful and sanitary methods of turkey egg hatching. They face the possibility of losing this business if they hatch poults in the same machine with chicken eggs from stock not tested for pullorum disease. Most cases of losses from pullorum disease in turkeys have been directly traceable to an incubator in which chicken eggs from flocks not blood tested were hatched that season.

Suggestions on Incubation

1. Turkey eggs should be gathered at least once daily, and stored in a cool place between 40 and 60° F. until set.

2. If turkey eggs are to be held a week or longer they should be turned daily.

3. Egg cases, equipped with duck-fillers, hold 200 turkey eggs and are quite satisfactory for holding and turning turkey eggs.

4. It is best to set turkey eggs within a week to 10 days after laying, although they will hatch well if held under the best conditions as long as three weeks.

5. When incubating turkey eggs in a cabinet type incubator, run the machine at the temperature which has given the best hatches with chicken eggs.

6. In a sectional incubator run at 100½, 101½, 102½, 103° F.,

Condensed from Turkey World, Mt. Morris, Ill., March, 1938

the first, second, third and fourth weeks, respectively; unless experience has indicated that better results may be secured at a different temperature. The bottom of the bulb of the thermometer should be 1⅞ inches above the egg tray, that is, even with the top of the turkey eggs.

7. Turkey eggs require as much moisture during incubation as chicken eggs, if not more, especially during the last three days of incubation. The relative humidity should be about 60 percent until just *before* the eggs pip, when it should be increased to 70 percent. If the forced draft incubator is run at 99½° F. (dry bulb) this means a wet bulb temperature of about 88°F., until the twenty-fifth day and 90 to 91° F., while the eggs are hatching. Humidity recommendations vary, according to geographical location.

8. Turkey eggs should be turned at least four times daily, from the second through the twenty-fourth day of incubation.

9. Faulty incubation frequently results in weakened poults.

10. Artificial incubation will increasingly play a large part in the development of the turkey industry, since sufficient experimental work has been done to show that turkey eggs hatch well in most well-built incubators, if properly managed.

11. Until experimental results indicate the desirability of a change, it is wise to follow with turkey eggs those incubation procedures that have given the best hatches with chicken eggs.

Yarn

About a hundred miles of cotton yarn are required to make a pneumatic truck tire.

Profits from Sound Woodlot Practices

Condensed from The Rural New-Yorker

James D. Curtis

DURING the Winter months, when the hardwood trees are free of leaves, the farmer or estate owner who is interested in improving the value of his woodlot, can work to good advantage. Silvicultural practices aim to raise the productivity and value of a forest by improving the composition and increasing the rate of growth on the trees that remain and as a result make available utilizable products from the material removed. The type of timber crop which is to be raised will vary, depending on the interests of the individual, but providing the woodlot contains wood in excess of his annual fuel requirements, the owner can, without stint or inconvenience, operate his forest as an investment. In other words, he can receive interest in the form of an annual supply of wood and at the same time not impair his capital but gradually build it up. In this connection, however, it must be remembered that a forest is a long-term crop and unlike most agricultural harvests, raising trees requires discernment and patience. Furthermore, woodlots are not perishable or seasonable crops and can be cultivated and marketed when desired—a distinct advantage. Few woodlots in America have been systematically "farmed" with the object in view of producing more valuable products than cordwood. Thus far, few sons have inherited a well-managed "wood garden" from their fathers. But that time will eventually come, as it has in older countries, and whether the son carries on with his father's farm or not, the well-tended woodlot, supporting trees which have been nursed since youth and which will produce valuable lumber, is worth much more than a forest where neglect has produced nothing but cordwood.

If the owner has a sizeable area in woods (30 to 70 acres), his best plan is to work towards several age classes, that is, have one group of trees 10 years old, another group 20 years old, another 30, and so on up to 70 years. The size and number of the groups will vary with the size of the property but in this way he can cut his oldest stand every 10 years, at the same time start a new one, and improve the remaining groups by careful cuttings for an annual supply of

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wood. Foresters work towards this ideal situation in managed forests, cutting each year an amount equal to the annual growth on the entire area, and hence perpetuating the supply.

When the forest is young, more can be done to put it into a productive condition for subsequent years than at any other time. During this period of formation you can either "make" or "break" a forest. Weeding, the silvicultural practice applied at this time (during the first 5 to 15 years), removes worthless species, trees of poor form, and leaves straight trees of commercial value whose crown or foliage is symmetrical and free from disease or mechanical injury. Because of their quality, these trees which are left produce lumber which will be in demand. The faster the growth, the straighter the tree and the freer it is from knots, the more valuable it will be for manufacture into lumber. Different stands of trees vary with soil, species and origin (from seed or sprouts) in the number of weedings they will require but it is seldom more than three. The trees from these weedings are usually small but they will serve as pea brush and bean poles for the farmer's or estate owner's garden.

Thinnings, or cuttings made in stands when trees are about six inches in diameter, are employed to yield an immediate return and to allow the trees that remain, with decreased competition, to grow at a faster rate than they did before. The crooked or otherwise undesirable trees which cannot be sold readily have usually been removed in an earlier weeding although it is inevitable that a few per acre always remain. Trees which are intended for the final crop (those to be cut at about 70 years of age) are selected usually about 15 feet apart scattered through each group. These will be the tallest, largest and most thrifty. Trees which are crowding these are removed and either used or sold for cordwood fuel. If they are sizeable, they may be converted into lumber and used about the farm or sold locally. Thinnings can be advantageously made every five years or so, although there is no objection to thinning lightly every year; in fact, this is preferable to heavy thinnings at less frequent intervals. Some species, like hemlock, red oak and hickory, are quick to respond to thinnings; others, such as white pine, red pine and white ash, do not answer so readily.

Pruning is an operation which removes branches from young trees and hence later produces lumber free of knots. In hardwood stands, keeping the trees close together serves to kill the lower branches by shading.

They finally die and drop off, a natural process. This is kept in mind during the thinning of a stand and hence no large openings are made. With conifers, however, the branches are tough, tenacious and are often the cause of low-grade lumber. Pruning the lower branches from the crop trees when they are not over four inches in diameter eliminates this danger. It is believed profitable at present only to prune to a height of 17 feet (a butt log) in three operations; the first with a pruning saw, and the others with a pruning saw and ladder. It can be done at any time of the year but early Spring is recommended, pruning from the ground the first eight feet of straight and thrifty trees when they are about 20 feet in height.

The discerning woodlot owner will realize that in his woods he has a tangible asset, which with due care can be made to increase in value as time marches on. This can be done only by appreciating that timber is as much a crop as any other product grown on the farm. By employing systematic cultural methods, which will be explained and demonstrated by the extension forester of the State in which he lives, the woodland owner can reach the objective of building up a well-managed forest simply and directly.

Dams

In Idaho, beavers are being caught by trappers and put to work by the government, building dams. The beavers can do about $300 worth of dam-building a year at a cost of $8 per head, and they bring their own scoops.—*The Furrow*

The Family Garden Deserves Planning

Condensed from Better Crops with Plant Food

W. B. Ward

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A GOOD garden should not only be a means of supplying food for the family as an aid in decreasing the living costs but should supply quality produce for daily use at a minimum expense. The family gardener who desires fresh vegetables and small fruits in season, with a surplus for canning or storing, should plan the garden long before the first planting date arrives. The best farm and home garden records come from those gardens which were carefully planned on paper, and a definite plan followed throughout the season.

Intelligent planning is based upon the knowledge of planting dates, the space required for the best development of the plant, and the length of time required from seed or transplanting time until maturity. With this information in mind, the garden may be planted to some crop or other from early spring to approximately 30 days before the expected frost in the fall, as oftentimes succession plantings of the same variety are more successful than the first. Sufficient seed should be ordered early. It is advisable to keep posted on the better varieties, as seedsmen are continually improving certain strains, and as soon as a better variety is on the market the older one should be discarded.

It has been the custom to garden certain parts of the entire farm, with the small kitchen garden close to the house, and sweet corn, tomatoes, and cabbage in various truck patches scattered to the other three corners. These scattered truck patches were cultivated only when convenient, the rows were spaced far apart in order to permit the use of horse-drawn cultivators, and the vegetables handled like any general farm crop.

The present trend is for more compact and well-arranged gardens so they may be easily cultivated with a wheel hoe, dusted or sprayed to control any sudden threats from insects or diseases, and at the same time cared for with the smallest expenditure of time or labor. Perennial vegetables, like asparagus, rhubarb,

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winter onions, and berries, should be planted along the sides of the garden so as not to interfere with either the plowing or cultivation.

Intensive gardening removes considerable plant foods from the soil. The garden area may be brought back to a high state of fertility by an annual application of manure and commercial fertilizers. Manure may be used at the rate of 20 to 30 loads per acre as an annual application. The manure should also be supplemented with other fertilizer containing phosphoric acid and potash especially, and oftentimes nitrogen is necessary. Perhaps 500 pounds per acre of a complete fertilizer containing from 2 to 4 per cent nitrogen, 10 to 12 per cent phosphoric acid, and 6 to 8 per cent potash would give the best results, although a sack or two of any fertilizer on the farm when applied to the garden would be beneficial. Fertilizer may be applied before plowing and the garden soil plowed from 8 to 10 inches deep. Lime is of particular value in the case of acid or heavy clay soils. A mellow garden soil with plenty of plant food may be gardened for years, and this type of soil is well adapted to wheel-hoe cultivation.

The small, well-constructed, and sturdy wheel hoe is finding great favor among the gardeners. Wheel-hoe handles should be long, adjustable to the height of the person using the tool, and have a small wheel and shallow cutting sweeps as standard equipment. The investment in a good wheel hoe is a little more than the cheaper ones, but in the long run the better tool will last from 20 to 30 years or longer, with better service.

Wheel-hoe cultivation permits closer row plantings, and such vegetables as beets, carrots, onions, etc., may be spaced so that once through with the wheel hoe will take out the weeds and leave a good mulch. For other crops that require wider spacing, two and sometimes three times through are necessary. The more vegetables planted to a given area, the less room will be allowed for the weeds to grow, and the ground will be shaded by the foliage of the desired plants. Shading of the ground does not permit excessive evaporation of moisture and also is an aid in preventing the organic matter from "burning out" from the soil.

Nutrition specialists suggest that each family should have on hand approximately 60 quarts of canned vegetables, or its equivalent, and 49 quarts of fruits for each adult member of the family, this amount of food to be consumed during the off-garden season, a 7 months' period from October to the following May for

the north central area. This 7 months' food budget may be supplied from the well-planned garden.

Those families with young and growing children will find that the boy or girl will consume as much fruit and vegetables as an adult and, therefore, should be counted full measure. On this basis, a family of four would require 240 quarts of vegetables and 196 quarts of fruits, or a total of 436 quarts, for the winter, canned, stored, or purchased.

The vegetables used are listed in the order taken from the farm and suburban home garden questionnaire, and show that the potato ranks first. Tomatoes, green beans, cabbage, lettuce, corn, peas, onions, carrots, turnips, beets, parsnips, spinach, sweet potatoes, and salsify follow in order of importance. Lettuce is generally purchased from the store; tomatoes, beans, corn, peas, spinach, and sometimes kraut and beets are canned, while the rest may be successfully stored and used fresh rather than canned. Of the fruit products, grapes and the berries rank first, followed by peaches, pears, plums, and apples. With the exception of apples, practically all of the fruit is canned. The storage budget should also be based upon the per capita consumption, and the following amounts are suggested for storing for each adult:

Potatoes	3½ bu.
Sweet potatoes	¼ bu.
Carrots	¼ bu.
Turnips or rutabages	¼ bu.
Beets	½ pk.
Onions	½ pk.
Cabbage	20 lb.
Apples	1 bu.
Popcorn (on cob)	½ bu.
Nuts (hickory, walnut)	½ bu.
2 large pumpkin or squash	
Small squash	½ bu.

Parsnips and salsify may be left in the ground over winter or dug in the late fall and buried.

The garden now plays a very important part in the family life. Not only are quality products grown and a saving shown on the expense account, but there is also a lot of real enjoyment in knowing that a good job was well done.

Calf Raising Problems

Condensed from The Jersey Bulletin

H. A. Herman

Missouri College of Agriculture

THE progressive dairyman is continually faced with the problem of maintaining his herd in numbers as well as at a high level of production. The losses of cattle from the herd each year are of considerable significance. With Bang's disease, sterility, mastitis and minor troubles taking their toll, we find the average dairyman replacing from 20 to 30 per cent of his herd each year. McDowell, studying some 10,000 DHIA cows, found that the average cow remained in the herd 4.7 years after reaching productive age. Larson, in a study of over 13,000 DHIA cows in New York State, found the average cow remaining in the herd until 4.6 years, a figure closely agreeing with that obtained by McDowell. Studies by Lush of the Iowa Station show the productive life of a cow to be 3.5 years after the first freshening. Similar studies conducted on the herd at the University of Missouri show the average productive life of a cow to be 4.16 years.

Thus when such large numbers of cows leave the herd each year it is highly important that proper replacements be available to make up these losses. Usually we look to well grown heifers, sired by a strong production bred bull and out of our best tested cows, for replacements.

It generally requires the first two years after freshening for a cow to make enough profit to pay for raising her and it is only after she freshens for the third time that we actually begin making profits. Thus, aside from raising good calves, one of our chief problems is to lengthen the time a cow remains in the herd in a productive state. In general the plan of raising heifers has distinct advantages over that of purchasing replacements.

The breeder who plans to maintain his milking herd through the purchase of cows will find this system expensive. Unless he is willing to cull closely and pay top prices for replacements he will find it difficult to improve or even maintain his herd average. It is commonly observed that herds which have

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maintained their numbers by purchase are generally no more productive today than they were five or ten years ago. Securing animals from various sources for herd replacement often introduces diseases such as Bang's disease, mastitis, tuberculosis, and Johne's disease, and is one of the most serious disadvantages of maintaining a herd through purchases.

Dairymen in the vicinity of large cities, where whole milk is sold and feed prices are high, often find it too expensive to raise heifers, and usually maintain grade herds, disposing of a cow just as soon as she declines in production or becomes a victim of disease. Incidentally, these dairymen are purchasers of many well bred heifers raised by the farmer-dairyman located further away from the cities. Farmers who sell cream and have skimmilk available, and breeders of purebreds seldom question the advisability of raising heifers.

The man who raises calves also has his difficulties. From birth to two years of age is a non-productive period with no returns on the investment. There is some danger of losing calves by death and disease after the investment in raising them; some may prove to be non-breeders; and some will prove to be inferior producers and therefore must be sold for beef. Nevertheless, the plan of raising heifers has outstanding advantages, as it generally produces good cows cheaper than they can be purchased; it is the most desirable safeguard against disease, and makes possible improvement of the herd through the use of good purebred sires.

One of the most common failures on the part of dairy farmers in general is the policy of raising all the heifers. Only in the best of purebred herds, and only when calves are from select ancestors is this justified.

There is little or no difference in the cost of raising a well bred and a poorly bred calf. Under most conditions it costs, on the average, from $50 to $80 to raise a heifer to producing age. The inferior calf is a liability from the day of its birth, and too many dairymen make the mistake of trying to raise all the heifers. Obviously only those heifers out of the best cows and sired by a good purebred sire should be raised. While all calves, both grade and purebred, which are sired by purebred bulls are not 100 per cent desirable, the majority will be worthwhile producers if the sire is carefully and intelligently selected.

Aside from the feed costs and the extra care and labor involved in raising the dairy heifer, the matter of high mortality and unthrifty calves is a matter of no small concern. The loss of calves

in some herds, due to calfhood diseases, has been a most discouraging factor to some of our best breeders. Furthermore, the general mortality in calf herds is often greater than we sometimes appreciate. Studies at several of the agricultural colleges indicate that from 75 to 95 per cent of the calves are born alive. In Bang's diseased herds, Dow, of the Maine Station, found that as many as 40 per cent of the calves were born dead. The Iowa Station reports that in their herd 8.3 per cent of the female calves are born dead and a total of 14.4 per cent died between birth and before freshening. In this herd then 22 per cent of the females dropped failed to reach a point where they could be considered herd replacements. Most of the losses occurred during the first two months after birth. Between the ages of 19 months to freshening age, the Iowa Station further reports that some 7.8 per cent of all the heifers born alive were sold for failure to breed. The final analysis shows that only about one-half the heifers born ever enter the milking herd.

Similar studies at the Missouri Station show the number of calves born dead is less than 5 per cent of all the calves dropped. However, 8.23 per cent of the calves die before 12 months of age. It was found in a study of 1,372 calves dropped in this herd that the causes of death were distributed as follows: scours 32 per cent; pneumonia 24 per cent; unknown digestive disturbances (aside from scours) 9.7 per cent; with minor ailments making up the balance.

The study further shows that the months of highest mortality, in terms of percentage of the calves dropped, were June, August, September and December. The chief losses during the summer months were due to scours, whereas the winter losses were chiefly due to pneumonia.

The figures tend to point out the losses in calf raising are often greater than we presume and call for greater attention to details of calf raising.

The program of successful calf raising begins with the pregnant cow. Cows should be allowed a dry period of approximately six weeks. Those given a rest are in better flesh, produce more and higher testing milk, and are usually more persistent milkers than those milked up to within a few days of calving.

The dry cow should be fed liberally on a slightly laxative ration. Plenty of legume hay and corn stover or silage, or good pasture when available, and from three to seven pounds of a rather light, bulky grain mix should put the cow in good condition for calving.

Many calves are lost shortly

after birth because of the filthy, germ laden surroundings into which they are born. The cow should freshen in quarters apart from the herd, in a roomy box stall or a separate pen. Aside from insuring the cow freedom and protection during calving, this practice is important in controlling Bang's disease.

The stall should first be scrubbed with hot water and then disinfected. A 13-ounce can of lye to 15 gallons of either hot or cold water makes an excellent disinfectant for this purpose. Any cresol compound or other standard disinfectant may also be used. After the stall is dry it should be lightly sprinkled with hydrate lime or gypsum and bedded with fresh clean straw or shavings to insure sanitary surroundings for the newborn calf. During the winter months cows close to calving should be turned outdoors for a few hours daily to insure plenty of exercise. Cows on pasture usually get sufficient exercise.

During the summer months there is no better place for the cow to calve than outdoors in a separate lot or pasture apart from the herd. From the standpoint of sanitation for the newborn calf, the surroundings provided in a good pasture are nearly ideal. Sunlight is one of the best destroyers of disease germs. However, where the herd is infected with Bang's disease, the difficulty of disinfecting and cleaning up pastures makes this practice questionable even though a separate calving pasture is maintained. Cows should never be permitted to calve in the same pasture where the main herd is kept.

Cows that calve normally usually get up immediately and begin licking the calf, which is Nature's way of starting respiration and stimulating circulation of the blood. The cow should be permitted to lick her calf dry but if she fails to do so, it may be briskly rubbed with a cloth until dry. This is very important during the winter months as it hastens drying and prevents chilling. In cold weather the newborn calf may be blanketed with a burlap bag until it is warm and dry. Occasionally the afterbirth or foetal membranes may stick to the calf's nose and must be removed immediately to prevent smothering. It is also wise to run the fingers around the newborn calf's mouth to remove all mucus.

There are several details immediately following the birth of a calf that should be a regular procedure in order to lower the calf mortality.

1. The navel cord of the calf should be disinfected with tincture of iodine as quickly as possible after birth to prevent disease producing germs gaining en-

trance into the body by this route.

2. The genitals and rear parts of the cow, particularly the udder and teats, should be thoroughly washed and the teats sterilized by wiping them with a cloth dipped in a mild chlorine solution before the calf nurses. This practice also aids in preventing contamination and spread of scours.

3. Strong, well developed, calves will be on their feet and nursing within an hour after birth. Weak calves which are unable to stand should be assisted to their feet and held up to the udder to nurse.

4. It is highly important that the calf receive the colostrum or first milk of the mother as this acts as a laxative and aids in starting the digestive system working properly. Colostrum also supplies the constituents highly necessary in blood forming processes in the newborn calf and furnishes the antibodies necessary for preventing disease until such time as the calf has established its own immunity. Studies at the Missouri Station show that 32 per cent of dairy calves die unless they receive colostrum.

5. It is well to leave the calf with its dam during the first one to three days of its life. After this time the normal, vigorous calf may be removed from its dam, taught to drink milk from a bucket, and raised by the method most economical and practical under conditions prevailing on each particular farm.

Missouri Agricultural Experiment Station Bulletin 377, Raising the Dairy Calf, describes six different schemes for raising calves. The method adopted depends of course upon the form in which milk is marketed. In general, however, the skimmilk feeding plan; the limited wholemilk plan, using dry calf meals; the reconstituted skimmilk plan; a grain mixture containing dry skimmilk powder; the commercial calf pellets, really a form of dry calf meal; and the nurse cow plan, make up the possible methods of calf raising open to the average dairyman. For details of these methods the reader is referred to Bulletin 377, which can be obtained by writing to the Missouri College of Agriculture, Columbia, Missouri.

The details of bucket feeding are constant sources of worry to calf raisers, but in general the following points must be observed.

After separation from the dam the calf should be taught to drink from a pail. It is usually advisable to withhold feed for 12 to 18 hours before attempting to teach the calf to drink so it will be hungry and will take the milk more readily. By allowing the calf to suck several fingers of one hand held in the milk, it can usually be broken to drink milk from

the pail in one or two lessons. Only fresh, warm milk should be offered.

Young calves must not be overfed since indigestion and scours invariably follow. As a rule the daily allowance of wholemilk, which should be in accordance with the weight of the calf, will equal 8 to 10 per cent of the body weight for the first week. However, one pound of wholemilk per day for each 10 pounds of body weight, is a safe rule to follow.

Calves should be fed from three to four times a day until they are about a week old. A calf weighing 60 lbs. at birth should be fed 2 lbs. of wholemilk at a feeding three times daily for the first week. Older calves may be fed twice a day, dividing the milk equally between the two feedings.

The milk for feeding purposes should be at a temperature of 95 to 100 degrees F. A thermometer should be used to determine the temperature of the milk as the use of the finger for this purpose is very deceiving.

Clean feeding pails and clean milk are essential in growing thrifty calves. Dirty feeding pails and contaminated milk are the most common causes of calf scours. The calf feeding pails should be thoroughly washed and sterilized after each feeding just as though they were to be used in the production of high quality milk. Discarded feed should be removed from the feed troughs daily. Attention to these small details is the best way to prevent disease.

The calf pens must be clean, dry and sanitary. Dirty calf pens and diseases such as scours usually go together. Special isolation quarters should be maintained for all animals showing evidence of sickness. Plenty of sunshine and proper ventilation are also essential. The calves must be protected from drafts and dampness.

Further details of calf raising are largely those of good management and feeding. In case of a disease outbreak, prompt isolation of the sick calf and immediate veterinary attention is recommended.

Versatile — Is the Word for Sulphur

Condensed from Armour

W. W. Duecker

ONE of the elements that contributes much to scientific agriculture is sulphur. It is not classed with the big three, nitrogen, phosphorus and potassium, but is considered as one of the minor elements. Yet perhaps no other element in its elemental form plays a more beneficent role in agriculture. First of all it is essential to plant growth; secondly, it protects growing plants and animals from disease and insects; and thirdly, it is utilized to convert the products of agriculture to a useful end, or to conserve such products.

Strangely, for one of the so-called minor elements, the quantities of sulphur removed from the soil by some growing plants are startling. The mixed grasses and hay crops require more sulphur than phosphorus. Some of our vegetables, such as cabbages and turnips which owe their particular flavor to sulphur, remove two or three times as much sulphur as phosphorus. The quantities of sulphur in the soil at present may be sufficient but the question of adequate supplies needs consideration. In relation to plant needs, available sulphur in many instances may be more limited than phosphorus and nitrogen. This is particularly true at the present when there are being developed very concentrated fertilizers containing high proportions of nitrogen, phosphorus and potassium, but practically none of the other essential plant foods. Such fertilizers did not prove satisfactory for cotton, potatoes and other truck crops on many southern soils. Many agriculturists suspect that such fertilizers were unsatisfactory because they did not contain calcium, magnesium or sulphur.

In the early Colonial days, Benjamin Franklin advocated the use of land plaster, calcium sulphate, on certain soils. Its use was well justified by the results obtained. Today, except in certain special cases, it is unnecessary to use land plaster because the manufacturer of superphosphate incorporates in his fertilizer both calcium and sulphur. Crop results, experimental researches and the test of time, all contribute to the proof that superphosphate is most admirably adapted to soil and crop needs. In addition to phosphoric

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acid, it supplies large quantities of calcium and sulphur, two elements whose function is not entirely understood, but whose need in agriculture is being definitely recognized.

Probably the first to realize the value of sulphur in agriculture were the owners of vineyards who used it to control certain fungus diseases of grapes. Since that time the appreciation of its utility has spread and now it enters into the manufacture of a large number of preparations employed to combat many types of plant diseases and pests. One of these, lime sulphur solution, has deservedly won a high place among our orchard spray materials and is used extensively both as an insecticide and fungicide. More recently, finely ground or dusting sulphur claimed attention. As such it is used extensively to control injurious agents that attack trees, ornamental shrubs and flowers. From Ithaca, N. Y., it is reported that sulphur can be used to control the Eastern tent caterpillar. Sulphur protects cotton from damage by the flea hopper. In combination with different metals it is applied in large amounts to fruit trees. It is a standard article in the protection of our citrus crop. Scab, mites, mildew, aphis—these are but a few of the diseases and insects which attack our apple, peach and pear trees and which can be controlled with one or another of the many sulphur combinations. Because of its nontoxic nature, it leaves no poisonous residue and is well suited for the protection of truck crops—beans, cabbages, celery and potatoes—that grace the daily dinner table. As a protector of farm crops, sulphur has few equals.

Not only is sulphur applied to the protection of plants but also of animals. Suspensions of sulphur in water control lice on goats and sheep. The addition of 2% of ordinary ground sulphur to the ration is said to prevent coccidiosis in chicks. Sulphur ointments are perhaps a standard remedy in the treatment of various types of skin diseases. Sulphurized salt blocks are finding favor with ranchers, and various sulphur compounds are used in preparing veterinary medicines and stock food.

Many believe that the losses to agriculture from weeds are greater than those from insects, plant, and animal diseases combined. Here also sulphur plays its part. In the form of dilute sulphuric acid it is used to control undesired growths, particularly plants with broad rough leaf surfaces. These, when sprayed with acid, are readily killed while cereals with narrow smooth leaves are but temporarily affected. Sulphuric acid has also been used to save potato crops

attacked by "late blight." The treatment kills the foliage, controlling the blight and thus permitting harvesting without waiting for the tops to die normally.

Having aided as a fertilizer and as a protector in bringing farm products to the harvest, sulphur does not cease its good works. It now assumes a new role, namely, that of conserving farm products and converting them to a useful purpose. In the form of sulphur dioxide it is utilized in the preparation of dried fruits and in the conservation of their vitamin content. In the same form it is used to bleach oats and barley, in the curing of hops and in the preparation of malt. The production of sugar and starch is facilitated by the same reagent. Sulfonate oils and sulphides are used in the tanneries. Sulfuryl chloride renders wool non-shrinkable. Many are the intermediate sulphur compounds constantly being developed to make more available and improve the raw agricultural products of nature.

One of the latest applications of sulphur to the solution of farm problems has recently been announced by government chemists. Heretofore it has been difficult to store certain perishable farm products. In order that they might be conserved they had to be processed as soon as harvested. This necessitated the construction of plants of extraordinary size that could be operated at best but a few weeks during the year. Costs, as may be anticipated, were high. A novel process has just been devised which may overcome some of these difficulties. This process which has been applied principally to sweet potatoes involves the treatment of the shredded or ground potatoes with sulphur dioxide. This causes the tissues to plasmolyze so that the juice can be pressed out much more effectively and the residue dried much more quickly and efficiently. It is thus possible to obtain at low cost a stable product that can be converted into starch or flour suitable for many industrial uses. The air dried product which can be stored indefinitely, will enable sweet potato starch factories to operate throughout the entire year instead of only two or three months in the fall. In large scale operations the soluble sugars in the expressed juices could possibly be converted into alcohol or stock feed. The successful application of this process in the sweet potato industry no doubt will lead to attempts to apply it to the conservation of other similar crops. Should these be successful they may have far reaching effect.

Many indeed are the functions of sulphur in agriculture. Here have been enumerated solely those applications with which

the agriculturist is familiar and which concern him directly in his work. There are many other uses, that concern him indirectly. The paints he uses to protect his barn, house or farm implements, may have been made with the aid of sulphuric acid. His tractor or automobile runs on tires vulcanized with sulphur, and the gasoline which propels it, and the oil which lubricates it, have been refined with a sulphur compound. Many new materials now considered necessities are available because of sulphur, particularly the modern plastics. Rayon or viscose is made with the aid of carbon disulphide.

It has been discovered that sulphur is a constituent of the valuable vitamin B_1, the lack of which causes polyneuritis and other forms of neuritis. It is an integral part of the new drug sulfanilamide, a compound whose marvelous therapeutic properties have led to its being described as the most important contribution to our materia medica since Ehrlich's discovery of salvarsan. The new drug has been remarkably effective in the treatment of septicaemia, pneumonia, meningitis, scarlet fever, and its range of usefulness is still to be learned. Finally, we have the SH group, the group which is said by scientists to be the key to life itself, a group vitally concerned with cell division and growth. Perhaps time will give us a better appreciation of the function of sulphur to agriculture, to life. Perhaps in the future we may adapt it more thoroughly to our needs and with its aid solve many of the perplexing difficulties that now beset us.

New Hog Method

Condensed from Capper's Farmer

M. N. Beeler

HOGS can be restored to their traditional function of mortgage lifting, John H. Hendriks asserts, by a system. And after making porkers pay the debt on his farm in Muscatine county, Iowa, during 7 of the depression years, he is willing to recommend his method to others.

"I've been practicing what is now called the Minnesota crisscross system of breeding for 20 years," he said. "That was really the beginning of my plan. I kept adding details as experience indicated. My way of feeding has been unchanged the last 10 years and about 1930 I adopted the present confinement system.

"Hogs paid off the mortgage. In addition they financed a building program which, combined with the debt, represented approximately half the original appraised value of my farm. And they did it during years which included the darkest period of the depression. That is the best recommendations I can make for my method of raising hogs."

Vital factors in his system include:

1—Breeding stock. Select medium type gilts or sows, stretchy but not stilt-legged, nor the other extreme, chuffy. "Half way between," is the way Mr. Hendriks put it. Female stock may be good purebreds, not necessary registered, or they may be first or second crosses of purebred parentage. Boars should be purebreds of the same type or sufficiently varying toward the stretchy to produce pigs which will grow rapidly to desirable market conformation.

And Mr. Hendriks insists upon a tried sire. By that rule he never has missed, during 20 years, getting his pigs to come in February and March, August and September. It's a worthy point for steady output and striking the right market.

2—Breeding practice. Follow the crisscross system in which boars of the breed represented in the sow parentage are alternated. The simplest form of this system is to select two breeds, such as Durocs and Polands, which is the cross Mr. Hendriks used in starting. Gilts of this mating would be topped with a purebred Duroc the first time, for instance, and a Poland the next. Second cross gilts would be bred to the boar of the breed which did not sire them.

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"Finally I brought in an outcross of Spotted Poland," he said, "and liked it so well that I decided to try a fourth breed, Chester Whites. Crisscrossing makes a 20 pound heavier pig at 5½ months old than straight purebreds, and that thrift is reflected in size of litters. Mine average 8 pigs marketed and I have sold 91 from 10 sows. That's proof enough to justify the system."

3—Sow management. Gilts are well grown and well fleshed at breeding. They are carried on an adequate ration, corn, oats and trinity mixture, to maintain their condition. At weaning time half the sows are removed from the pigs, shut in a dry lot and fed sparingly until the milk flow stops. Within three days they come in heat and are bred at the rate of 3 or 4 a day. The remaining half of the sows are handled the same way.

After the sows are bred the boar is kept with them for three weeks. If no more of them come in, he is removed and the sows are turned into a lot, with an old shed for shelter, where the cows are allowed to run. They remain in these quarters until farrowing time. There is a little grass in this lot but sows do not follow cattle on pasture. Water is supplied automatically and the ration, after milk flow ceases, consists of oats, trinity mixture and all the corn they will take.

"I want them to regain their flesh as rapidly as possible," Mr. Hendriks declared, "and so crowd the corn into them. When they are well finished, fat enough to kill, I begin limiting the grain. Half a bushel of corn in the morning, half a bushel of whole oats at noon and at night, together with a little trinity, will carry 12 sows and maintain them, once they have been conditioned, until they are ready to farrow.

"At farrowing time I stand by to render any assistance necessary and to take care of the pigs. Sows get no feed for 24 hours—only water, which in cold weather is warmed to temper the chill."

Sow are kept in the herd as long as they breed, farrow good thrifty litters, maintain their udders and remain good mothers. Some have farrowed 18 times.

4—Location of the hog plant. Put buildings and feeding floors where they will be convenient and where close watch may be kept over the hogs. "Mine are at the farmstead," said Hendriks, "where I can take care of the stock with least effort. That is necessary under the intensive system that I follow."

5—Equipment. Mr. Hendriks has a permanent hog house, 24 by 36 feet, floored with concrete. Adjoining it is a fenced concrete feeding floor, 18 by 70 feet, which may be divided with a vertical-lift division panel. On these sur-

faces he keeps 70 to 120 fattening hogs. Built-in self feeders for corn and bins for other feed ingredients are located under shelter. Water under pressure is available for automatic fountains, for cleaning the floor, cooling the hogs in summer and mixing slop.

6—Sanitation. Follow fundamental principles of the McLean county system for permanent farrowing houses. Mr. Hendriks scrubs the floors thoroly and disinfects with lye and dip. Sows are washed in sudsy warm water before going into their pens to farrow.

Inasmuch as pigs remain on the concrete all their lives, good housekeeping is necessary. The floor is swept three times a day and washed twice a week. Sunshine is considered to be the best disinfectant and so the outdoor portion of the floor requires no treatment. Covered portions are sprayed with dip after washing.

7—Pig management. As soon as little pigs are strong enough to make exploring expeditions from the maternal pen, at about 2 or 3 weeks old, provide a creep where they'll find rolled oats or oatmeal in a self-feeder. Mr. Hendriks puts two congenial sows together and uses the vacated pen for a creep. All pigs in the house run to it.

Boars are castrated at a week old and all pigs vaccinated two weeks after weaning. Normally fall farrowed hogs are out of the way of spring pigs, but if they overlap other facilities are used for spring farrowing. Sows removed from suckling quarters at weaning time are bred and fed for conditioning as previously described, and farrow their fall litters around a straw stack or in a shed, in which they and their pigs are held until permanent quarters are freed by marketing spring litters. Fall pigs are then given a vermifuge and confined to the thoroly cleaned finishing floor.

8—Weaning. When pigs are 7 weeks old, sows are removed from the farrowing house—weaned from the pigs, which always are left in their permanent quarters where they have learned location of water and use of feeders.

9—Feeds and Feeding. As soon as pigs will drink, Mr. Hendriks gives them what skimmed milk he has mixed with a little red dog flour. By the time they are consuming considerable quantities of the oatmeal, he changes to a mixed feed. The formula is 25 pounds oatmeal, 50 pounds cracked corn, 25 pounds red dog flour or high quality shorts, 20 pounds 60 per cent tankage and 10 pounds alfalfa meal. To 100 pounds of the mix add 1 pound of salt. This and shelled corn are kept in self-feeders. In the second batch the oats allowance is re-

duced to 10 pounds. By the time pigs are 10 weeks old rolled oats or meal will have been eliminated.

By the time pigs are 12 weeks or 4 months old, they will have been changed over to the following slop formula: For one barrel add 2 bushels finely ground whole oats, 2 gallons linseed meal, 2 gallons soybean meal, 2 gallons red dog flour, 2 gallons alfalfa meal, 1 pound salt. Add what separate milk is available and fill up with water. The wet feed is mixed and given fresh three times a day, a barrel to 80 pigs. In addition they receive protein concentrate mixture composed of 200 pounds tankage, 100 pounds alfalfa meal, 50 pounds linseed and 50 pounds soy meal. This is the trinity mixture formula except that soy meal replaces part of the linseed to reduce cost. He may vary the linseed quantity to regulate bowels. Cobs from his own shelled corn are burned to charcoal and fed as a mineral.

The foregoing ration, shelled corn, slop mixture and trinity, constitute the finishing feed winter and summer. "It sounds complicated," Mr. Hendriks admitted, "but remember I confine my hogs, bring their pasture to them in a strictly balanced feed. All they get is what I feed them in that floor. They don't need to rustle for vitamin and mineral rich green feed. It's all in their troughs. There is no restless, feed and fat consuming search over a 40 acre field to find what their appetites crave. They eat, drink at will, rest and grow fat. In summer they are as comfortable as hogs can be made and in winter they are warm.

"With every factor under control in this confinement system, my fall pigs do as well as those farrowed in spring. And I can make marketable hogs in 5½ months. That enables me to get in ahead of the heaviest runs. Spring pigs are ready by the last of August and fall pigs by the last of February. Prices the last of August or first of September will average up to $2 a hundred more than a month later when the bulk of spring farrowings are sold. In February the spread is not quite so much. I sell to a buyer who pays a little premium because he and the packers have come to know my hogs."

And that quality is known not alone to killers. It was recognized by judges a year ago when Mr. Hendriks was persuaded to take 6 barrows directly from his feeding floor to the National Swine Show. There he won first, second and third on pen of barrows, first and second on heavy barrows, second and fourth on medium and champion individual barrow. It was his first experience as a showman and the bar-

rows had received no special attention other than that given the whole farrowing.

Sample returns indicate the weights his hogs attain. One fall his first litter was farrowed August 15 and the last September 8. The first sale, 24 head, was made February 10, and weighed 5,740 pounds. Another shipment of 25, March 3, weighed 6,210. Of a spring farrowing, February 21 to March 8, a first shipment of 25, August 20, weighed 6,010; two others of 20 and 22 head, August 24, weighed 4,230 and 5,130 respectively. From 10 sows which farrowed February 20 to March 23, 1938, he raised 78 hogs. Forty-five sold August 24, weighed 10,380 pounds.

Mr. Hendriks operates a quarter section farm. His rotation consists of corn, oats and mixed clover, which is seeded in the proportion of 2 parts red to 7 of sweet. What he needs of this for hay is cut and the rest turned under. Cream is sold from his 10 Shorthorn cows so skimmilk will be available for the hog slop. Calves are vealed.

Certified Seed Potatoes

Condensed from Market Growers Journal

E. V. Hardenburg

Cornell University

CERTIFIED seed potatoes have proved profitable in the vast majority of cases, whether the planter be truck farmer, market gardener or home gardener.

The average results from thousands of comparisons between certified seed and common seed show emphatically that the former may be expected to yield an increase amounting to at least 50 per cent.

Certified seed is now available in considerable volume in 21 states of this country and all of the maritime provinces of Canada. It is relatively inexpensive when one considers the results to be expected from it. Tests in seven counties of New York covering a period of six years showed an average gain of 78 bushels per acre for certified over uncertified seed.

A gain of only 25 bushels per acre would pay the extra cost of certified seed if the seed cost a

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premium of 50 cents a bushel and if the yield increase were sold for only 50 cents a bushel.

Most of the certified seed available today originated from selected foundation stock and is therefore potentially high yielding. Its quality varies mainly in the small percentage of virus diseases such as mosaic, leafroll, spindle-tuber and yellow-dwarf which it may contain. Recently those in charge of certification standards in the various states and provinces have co-operated in evolving a fairly uniform standard of requirements. The maximum tolerance allowed of the total of all virus diseases is seldom over 2 per cent and of all diseases combined 4 per cent.

Too often buyers of certified seed criticize it because it does not appear fancy in the bag. Good appearance has far less to do with seed quality than does virus disease. Ill-shaped tubers showing a small amount of scab and black scurf may be a much better buy in seed potatoes than fancy ones if the former are free from virus disease and the latter are not. The best insurance of seed quality for the critical buyer is the certification tag of the official state certifying agency. If the tag is official, it means that the seed was grown in fields inspected and found to meet the rigid standards now required in most states.

Usually the percentage of acreage passing is between two-thirds and three-fourths of that inspected. This year only 46 per cent of the acreage in Maine passed the second field inspection.

Although most seedsmen do list seed potatoes, they usually are not specialists in this field. The careful vegetable seed buyer patronizes the firm which specializes in the commodity he wants. So in this case, it may be best and cheapest in the long-run to buy seed potatoes from either the certified seed grower or his responsible marketing agency. The local farm bureau agent can tell you of any seed growers nearby. A letter to your state department of agriculture or to your state college will bring you an up-to-date list of seed sources.

Dwarf Fruit Trees

Condensed from Farm Research

H. B. Tukey

A DWARF fruit tree, in horticultural usage, is a fruit tree grown upon a rootstock which tends to dwarf the tree. There are, however, other means by which a tree may be dwarfed. Pruning the top regularly and severely is a well known means of bringing about dwarf condition, well appreciated in Europe, where trees are carefully groomed and shaped. Also, pruning of the roots or restricting their spread or absorptive ability is a dwarfing practice, as the growing of trees in pots, drums, and sunken rims which confine the roots. Again, withholding nutrients and moisture may produce a dwarf condition, as the miniature "bonsia" and "hachiuye" of the Japanese, including not only fruit trees but various ornamentals and forest trees as well.

But the dwarf tree which attracts attention today is one produced by growing upon a dwarfing rootstock. Such stocks are by no means modern innovations. They have been used in Europe for centuries, some for upwards of three centuries—not alone for the production of garden plants and trees trained to special forms, but also for commercial production of fruit.

For the stone fruits, that is peach, cherry, apricot and plum, there is no generally satisfactory dwarfing root, tho for that matter there has been no great clamor for a rootstock with which to dwarf them; in part, because the trees are already small enough.

The pear and the apple, however, present a different picture. For both of these classes of fruits there are rootstocks which produce a decidedly dwarfing effect and of varying degrees.

The quince is the common material upon which to dwarf the pear. Any quince may be used, but the Angers quince has been found most desirable. Tenderness to winter cold, the ravages of fire blight and the relatively lowly position into which the pear has fallen in eastern fruit circles limit the immediate importance of the problem.

Dwarfing Stocks For Apples

As for the apple, various dwarfing stocks have been used, all of Old World origin, and of the same species as the material worked upon it. Roughly, they

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have been divided into the very dwarfing forms, called Paradise, and the semi-dwarfing forms, called Doucin, but the designation is by no means accurate and has led to much confusion.

As one reviews the experiences of the past in America one is forced to admit that dwarf rootstocks have not given a good account of themselves. Investigations just at the turn of the century in New York State give a good summary of the recurrent interest in dwarf trees—the rise, the trial, and the demise.

Interest in dwarf apples was aroused at that time by the severity of San José scale, an insect pest about whose control there were then some misgivings. It was thought that fumigation of the trees offered the best possibilities for control, and since such a practice meant the covering of the tree, attention was immediately focused upon the dwarf tree.

Results from trials made at that time led to the conclusion by the fall of 1914 that "dwarf apples should not be planted in commercial plantations. "The complaint was made that dwarf trees broke off, blew over, were subject to winter injury, suckered, and were shallow rooted. Yet it must be noted in evaluating the results that interest in dwarf trees was by this time on the wane, and large-scale commercial operations were on the upswing.

With this generally unsatisfactory background, why discuss dwarf trees further? Because for some reason or other interest in rootstocks for fruit trees has in recent years been rolling up from all sides and clamors for attention. The dwarf root stock is only one of the angles to the entire rootstock problem, but it is as loud as any in its demands.

No doubt a great share of this interest in rootstocks arises from the fact that as one after another of the various limiting factors in fruit production are met and conquered, another rises to take its place. Insects and diseases are now under at least a semblance of commercial control; pollination, fertilizers, cultural practices, transportation, storage, and handling are all fairly well understood. There are those who feel that the rootstock is the next problem to demand attention, and the northeast desires a smaller tree.

A grower writes recently, "There is no money in big trees. I will leave them for the other fellow. I want bush trees." Questions submitted by growers to the question box at the 1938 meeting of the New York State Horticultural Society also indicate clearly the same tone of thought.

Another grower writes, "I have

the financial ability and, I think, the courage to make a planting of 10,000 semi-dwarf trees, if you will tell me the rootstock."

Further, the economics of the situation are plainly in favor of a smaller tree. In these days of more rapid change in market demands, in consumer varietal preference and in new varieties, the arguments are all in favor of some system which will give a more rapid adjustment in the orchard to meet these conditions. Smaller trees mean more trees per acre, earlier bearing age, larger volume per acre of the new variety in early years, maximum production for a few years, and then removal of the orchard to be replaced by something else. One need only recall the rise of important fruit-producing areas to realize that they made their reputations with young trees. As soon as the plantings became older, the section waned, and some other and younger competing section took its place.

Besides these arguments there are those of easier and more efficient spraying, thinning, pruning, and harvesting. Further, in these days of tree-ripened fruit and the growing importance of harvesting fruit when it is properly matured, "spot picking" is an important consideration made simpler by small trees.

The interest, therefore, is not so much in the garden tree, as in the semi-dwarf, or semi-standard tree. Yet there is some interest among amateur gardeners and the small home owner for a very dwarf plant—one that will grow no taller than a man and which will bear fruit the first year it is planted.

What are the possibilities of securing the dwarf and semi-dwarf trees that are sought? Fortunately, there is a definite promise, although only through trial will their real value be decided, and this promise lies in the new "old" rootstocks, of Old World origin, which are now receiving attention in this country. They are new in the sense that some have never been given a trial in America. They are old in the sense that some of them are nearly 100 years old and have been known in European fruit circles for generations.

A modest beginning has been made at the Station in propagating, disseminating, and attempting to evaluate the possibilities of these rootstocks for eastern orchard conditions.

Protein Supplements

Condensed from Hog Breeder

Prof. C. E. Aubel

Kansas State Agricultural College

A GREAT variety of feeds high in protein are used to balance rations.

1. *Dairy By-products.* — The proteins found in skim milk and buttermilk are excellent for hog-feeding purposes, because they are rich in protein and mineral matter. When plenty of milk is available no other protein concentrate need be added to the grain ration. Skim milk and buttermilk have approximately the same value in the ration for hogs. Feeding tests show that about two or three pounds of milk are required to balance one pound of corn for growing and fattening pigs not on pasture. If the pigs are on pasture it is unnecessary to feed so much. When the supply of milk is abundant and cheap a larger proportion may be profitably fed, especially when grain is scarce and high in price. About two gallons of skim milk or buttermilk are required to equal a pound of tankage.

2. *Tankage.* — This is a by-product of the packing industry. It is a good source of protein and makes an excellent supplement for grains for growing and fattening hogs. It is extremely rich in protein and mineral matter, but contains little carbohydrate, so is especially valuable as a supplement to corn and other grains. A 60-pound pig fed on corn alone will require on the average approximately 600 pounds of corn to make 100 pounds of gain, whereas he will require only 400 pounds or less of corn when he receives 1 part of tankage to 9 parts of corn.

Pigs fed corn and tankage will gain about 50 per cent faster than those fed corn alone. Hogs allowed to help themselves from a self-feeder filled with corn and tankage in separate compartments will eat about 85 per cent corn, and 15 per cent tankage when they weigh from 60 to 100 pounds; about 90 per cent corn and 10 per cent tankage at from 100 to 175 pounds in weight; and about 95 per cent corn and 5 per cent tankage at from 175 to 200 pounds. Tankage often appears to be high priced, but tests show that 1 pound properly used will

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save 5 or 6 pounds of corn. In other words, 100 pounds of tankage is worth in round numbers about as much as 9 bushels of corn. It should never be self-fed, however, unless the grain is self-fed.

3. *Meat and Bone Scraps.*—Recently a new protein supplement has become available for swine feeding. This is meat scraps, or meat and bone scraps, which is produced through a change in the method of processing meat and bone residue in packing houses. The change is from the old tank steam rendering method which produced the digester tankage to a new dry renderizing process. The later method requires less expensive machinery and is more economical to operate for the packer; consequently, more meat scraps will likely be on the market as time goes on.

Meat and bone scraps is lighter in color and has less odor than digester tankage. The protein content varies in the feeding material produced by the two methods. The meat scraps usually contains from 50 to 52 per cent protein, while the steam rendered tankage contains about 60 per cent. They usually sell for about the same price. In some experimental work at the Kansas Agricultural Experiment Station meat scraps was found to be as efficient as digester tankage for full-fed swine in both dry lot and pasture.

4. *Wheat Shorts.*—Feeding experiments have shown that grain by-products such as shorts are not adapted to serve as the only supplement to grain because they supply the same character of protein that is furnished by the grains. One pound of tankage contains about as much protein as four pounds of shorts. Too much bulk would have to be consumed to secure enough protein from shorts to make a satisfactory substitute for tankage in growing and fattening young pigs for market. Furthermore, tankage is a better source because it supplies the character required to supplement the grain. Shorts will improve a corn and tankage ration, but not enough to justify the additional expense. It must be purchased as cheaply as corn to justify its use as a fattening feed, and at one-fourth the cost of tankage to justify its use as a protein feed.

5. *Linseed Meal.* — Linseed meal is another high protein content supplement which contains about half as much protein as tankage. It is not suited for feeding as the only supplement to corn and other grains, especially in the dry lot. A little better results are secured when fed to hogs on pasture. However, linseed meal is worth only about one-third as much as tankage.

6. *Cottonseed Meal.*—Cottonseed meal is much the same as linseed meal in protein content and feeding value when fed alone with grain. In addition, it contains a toxic element which may prove poisonous to hogs when using it as the entire source of the protein supplement. The amount of this poisonous element varies. Sections of the country in which it is grown, the climate, and the method of preparing the meal are said to affect its poisonous content. Hogs have been fed on cottonseed meal without any ill effects, but it was not as profitable as tankage even at the low price of cottonseed meal compared with tankage. It is inadvisable to feed cottonseed meal, therefore, as the only protein supplement. Its greatest value as a feed for hogs lies in its use in protein mixtures. It may cheapen the cost of such a mixture.

7. *Soybeans.*—Soybeans which are adapted in eastern Kansas are a home-grown source of protein that may be used to a limited extent. The protein content of the seed is about 36 per cent. They are low in minerals, containing about 5 per cent; but high in oil, averaging about 17 per cent. The protein is not of the right quality to supplement the common grain ration. The beans are not palatable to pigs, and if fed in amounts of over 14 per cent of the grain ration for fattening hogs the oil of the beans produces a large proportion of soft, oily, or limp, unattractive carcasses known as "oily" or "soft pork" on which the packer must cut the price. The lower market price reacts unfavorably on the price of live hogs suspected of having been fed on soybeans.

About three-fourth of a pound a day for each sow in gestation will provide the supplement necessary to her grain ration.

Since soybeans are low in minerals these should be supplied in a mixture of 2 parts steamed bone meal, 2 parts ground limestone, 1 part salt. Grinding beans is unnecessary, as pigs prefer the whole bean. Grinding exposes the oil to the air, and in hot weather bacterial action makes them rancid and unpalatable. There has been some attempt to improve the use of the whole bean by cooking or roasting. This makes the bean more palatable, but it does not prevent the softening effect on the carcass, and consequently does not change the amount that can safely be fed.

8. *Soybean Oil Meal.* — The residue remaining from the removal of the oil from soybeans is known as soybean oil meal. It is a better hog feed than the original beans, because the objectionable "soft pork" producing oil has been removed. The

meal contains about 42 per cent protein. it is one of the best protein supplements of plant origin. It is very palatable, may be safely self-fed as a supplement to farm grains, but like the bean, should be fed with a mineral mixture.

9. *Pastures.*—A ration of corn and tankage has for many years been considered the standard for growing hogs. It is a good one, and justifies its use even on pastures. Pasture crops, especially alfalfa, clover, rape, cowpeas, and soybeans furnish some protein, but not enough for most economical and most satisfactory gains. The need of additional protein, even on alfalfa pasture in carrying pigs from weaning to marketing, is shown by a test covering a period of 90 days. The pigs getting corn alone on alfalfa pasture weighed 159 pounds at the close of the test, while those receiving corn plus tankage on alfalfa weighed 222 pounds. One pound of tankage or its equivalent should be fed with each 19 pounds of corn on alfalfa pasture. If no pasture is available 1 pound of tankage or its equivalent should be fed with each 9 pounds of corn. A better practice is to allow the pig to help himself to corn and tankage from a self-feeder as he sees fit. He will balance his ration satisfactorily and economically.

10. *Alfalfa Hay.*—In the winter the supplying of pasture for additional protein in addition to tankage is impossible. However, good, bright, leafy, green alfalfa hay which contains the essential elements of a pasture, except its succulence, may be provided in a rack. Such a practice is a profitable one. In a test with fattening hogs at the Kansas Agricultural Experiment Station it was found that pigs receiving corn, tankage, and alfalfa hay gained nearly one-fourth pound more per head per day, and required 10 per cent less corn to make 100 pounds gain than the pigs receiving corn and tankage without alfalfa hay. Because of its bulk, alfalfa cannot be recommended as the sole source of protein in the hog ration. It cannot be too strongly emphasized that breeding hogs as well as fattening hogs should have access to good, green, leafy afalfa hay at all times when good pasture is not available.

Protein Mixtures

Protein-rich feeds in the form of mixtures have been devised to supply the protein for hogs. One such combination that has been received with considerable favor is composed of 50 per cent tankage, 25 per cent chopped alfalfa hay or meal, and 25 per cent linseed oil meal. This mixture when fed with corn in the dry lot has given excellent results. It has the advantage of

supplying sufficient protein and at the same time a variety of proteins that supply the amino acids lacking in the protein on a straight corn ration. It also provides the protein in an economical form. When hogs are fed on pasture the alfalfa meal should be omittted from the mixture. Allowing pigs in the dry lot to help themselves to good quality hay in a rack may well replace the meal in such a mixture. The pigs will consume the amount they require.

Other feeds, such as cottonseed meal, soybean oil meal, peanut meal, gluten meal, etc., might be included in mixtures if their cost is low enough to justify their use. Generally, protein mixtures should be made up of not more than three feeds and should contain 50 to 75 per cent tankage. Mixtures containing a large number of feeds do not justify the expense of mixing them. Under Kansas conditions tankage and alfalfa hay, self-fed, with perhaps some linseed meal or cottonseed meal replacing a part of the tankage, may be expected to gain as economically as pigs receiving any other protein supplement.

Lime

It has been demonstrated in Ohio that a dollar spent in liming the soil pays returns of from two to eight dollars, depending on the original degree of soil acidity and the kind of crops grown after the lime is applied.

—*The Furrow*

The Tether System of Pig Breeding

Condensed from The Poland China Journal

THE practice of tethering, or "tying up" brood sows in farrowing quarters a couple of weeks before they are due to farrow, and leaving them tethered until the pigs are several weeks old, unknown to American breeders, is employed to some extent in England. In the "Pig Breeders' Annual," issued by the National Pig Breeders' Association of England, the practice is described by R. B. Peacock, of University Farm, at Cambridge, as follows:

The system of tethering suckling sows has now been in use on the University Farm for more than three years, and on the whole it can be said to have been a distinct success. Prior to the adoption of this system the sows farrowed indoors in wooden pens with concrete floors. For some time previous to 1934 poor results were secured in these pens, small litters of unthrifty pigs being weaned. The chief cause of this unsatisfactory state of affairs was anemia, and since the only sure way of preventing this disease is to let the young pigs have access to the ground from the time they are about a week to 10 days old, it was decided to adopt some method of outdoor breeding.

For various reasons the tether system was adopted. A beginning was made with two huts and two sets of harness in May, 1934. Additional equipment has been added at intervals until at present there are 20 huts, enough to accommodate the entire herd of 45 to 50 sows, half of which farrow at approximately quarterly intervals. The farrowing huts are, naturally, the most expensive part of the equipment. Those in use on the University Farm are 8 feet long, 5 feet wide and 5 feet high. They are fitted with a farrowing rail, strong oak skids, and a small door at the back, and cost approximately $30 each. Much cheaper homemade huts are in use on some farms, and more elaborate and expensive houses on others.

From our experience there would appear to be no need for larger houses; in fact, a small hut is preferable, because it is warmer in winter and it insures that the sow can lie only lengthwise of the hut. This is an advantage at farrowing time, because whichever way the sow lies she can be attended to, either

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through the doorway at the front or through the little trap door at the back. There is no actual door to the house, but a sack can be hung from a rail above the doorway to provide greater comfort for the pigs in winter. Also the doorway can be blocked up by slips of wood if, for some reason, the litter has to be shut in. Two of these slips of wood, each five inches wide, are put in when the sow farrows and are left in until the pigs are about a week old. This prevents the little pigs from straying away from the hut, but does not prevent the sow getting in and out. A cast iron water trough is bolted to the front of the hut and holds five gallons of water. This trough has a galvanized iron lid which the sow soon learns to lift, but which prevents other stock in the field from drinking the water.

The "Barto" type of harness and chain is used. It consists of two leather straps, one round the neck and one round the body just behind the forelegs. The two straps are fastened together by a chain between the forelegs and by a leather strap between the shoulders. The tether chain is 30 feet long and is fastened down by a stout iron peg 15 inches long. A spring attachment can be fixed between the chain and the harness, so that sudden jars which a sow gives herself when first tethered are lessened. This part of the equipment costs about $7.50.

As a rule sows are tethered about a fortnight before they are due to farrow and left on tether until the litter is eight weeks old. During this period they are fed cubes—14 to 16 pounds per head in winter and 12 pounds in summer—and water is before them all the time in the troughs in the huts. As soon as the little pigs will eat they have access to an appetizing ration in a creep. The ration must be appetizing or the little pigs prefer the sow's cubes, and it almost becomes necessary to creep-feed the sows.

After weaning their litters, the sows are brought to the main building for service. They are then transferred to small paddocks where they remain until they are tethered again. It has been found that the young pigs do better if left outside for a month after weaning than they do if brought directly into a Scandinavian type fattening house, at any rate in summer. In winter, however, except on very light land, it is preferable to let them have the run of a semi-covered or covered yard for these four weeks. This alternation between paddocks in summer and yards in winter gives the paddocks a chance to recuperate after heavy stocking.

A light float, equipped with a 100-gallon tank, is used for cart-

ing water, cubes and straw, and with the tank out it is used for transporting the little pigs after weaning. The huts are moved onto fresh ground every week to 10 days in winter and every three weeks in summer, while the whole unit is moved to a fresh field every six months. An interval of over two years elapses between one folding and the next. The intensive manuring which the field receives makes it in good heart, and as a rule a crop of hay is taken first year after folding.

The system has all the advantages of an outdoor system of breeding compared with indoor systems, and in our opinion it has certain advantages over other systems of outdoor breeding. Losses from anemia and trouble from internal parasites have been eliminated, and larger litters of individually heavier and thriftier pigs have resulted. Our average number of pigs weaned over the last two years was almost exactly eight, and the weight at eight weeks varied from a winter average (October to March) of 29 pounds to a summer average (April to September) of 34 pounds. These figures may not seem very impressive. They include, however, every sow which farrows, and on account of the sudden expansion of the herd they include an unusually large proportion of litters from gilts and very old sows.

No doubt equally good results could have been obtained under any system of outdoor breeding. What, then, are the advantages of this system over other open-air systems? Perhaps the most important advantage of the tether system, when compared with other outdoor systems, is the relatively small amount of capital tied up in equipment. Moreover, the depreciation on huts which are moved on an average only once in two weeks must be considerably less than on fold units which must be moved every day. The large area of ground allowed to the sow, and the free run for the piglings avoids undue poaching of the land in winter. When compared with the system of having semi-permanent grass runs and fairly elaborate farrowing houses, tethering commends itself on the ground of economy, and also for the ease with which the pigs can be continually kept on clean ground. In many cases no wire at all is required, for the little pigs do very little damage in neighboring fields even if they are arable, though it is realized that if there is a risk of the piglings roaming onto a neighbor's fields sheep netting would then be required to keep them within bounds. No doubt there often is this risk, for the little pigs will sometimes wander more than a mile from the sows, especially in autumn when crab apples, acorns,

beech mast, etc., are available. The ease with which young pigs can be creep fed is a feature of the system worth stressing. Two large communal creeps will provide facilities for the young pigs from 15 to 20 sows.

As might be expected, the system is not without its disadvantages, especially for the pedigree breeder who keeps records of weights at a particular age. Lack of control over the little pigs, especially in summer, is undoubtedly one of the chief drawbacks to the system. In winter it is possible to shut in the pigs at night and to attend to them the next morning, but in summer the pigs seldom sleep in the huts, preferring to lie out in the open or in the covered creeps. Catching them at the creep is one way of dealing with them, but it is not entirely satisfactory, nor is driving them into a pen in the corner of the field. For the man who does not keep accurate records this is not much of a problem, but for the man who does it bristles with difficulties, and however the problem is solved, extra men have to be sent for roundup.

As with other outdoor systems, problems arise in connection with the pigs rooting in winter and with the little pigs becoming scorched in summer. In the former case it has been found that the only way to stop the sows rooting, when the ground is very soft, is to put three or four of the old-fashioned copper rings in the snout. A bull ring which has been in some time will not prevent the sow rooting up soft ground in winter. Although scorching makes the backs of the young pigs rough, they experience little if any check because of it, especially if they are allowed out of the hut as soon as they can get about easily.

Sows occasionally carry mud into the houses at farrowing time and bury the pigs, and they occasionally farrow outside in cold weather. Because of this the sows now farrow indoors during winter months, and are taken out when the pigs are a week or 10 days old.

Trouble with sows refusing to settle down in harness has been negligible on this farm. In my opinion the important thing to do when tethering a gilt for the first time is to stake her down quickly and leave her at once. She will settle down better on her own than if men are standing about watching her.

From our experience on the University Farm there would appear to be no doubt as to the financial success of the system, especially when compared with old wooden farrowing quarters or adapted farm boxes. After three years' experience our verdict might be best expressed as "satisfaction given."

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